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April 1984
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RUN

The Commodore 64 & VIC-20 Magazine

**Program of the Month
Disk Editor 64**

The Psychic 64: Will You Fall Under Its Spell?

Get Your Commodore in Tune With the New Wave

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OSC
MOD 08
ENV
#38 SOUND
#17 SCORE

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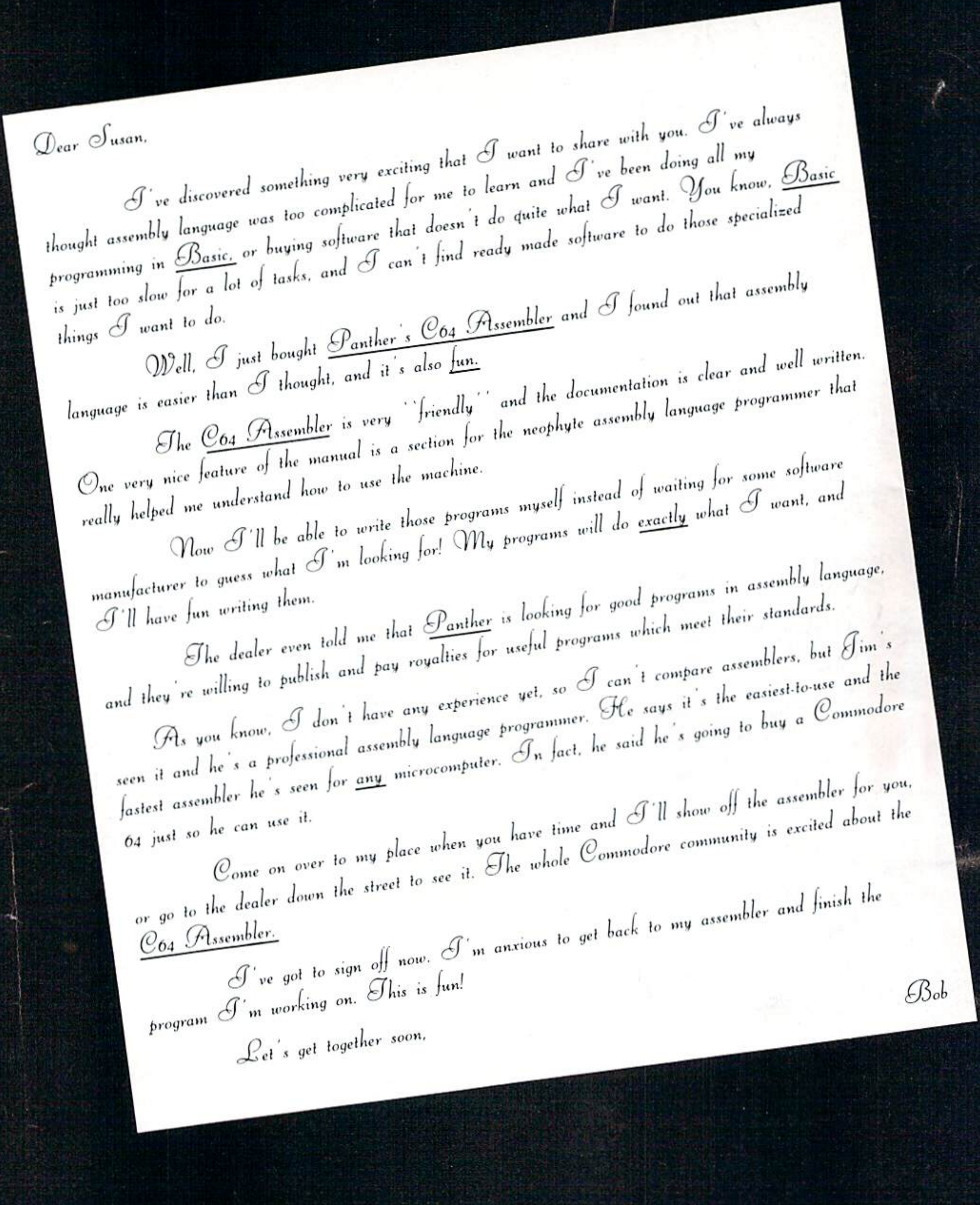

Dear Susan,

I've discovered something very exciting that I want to share with you. I've always thought assembly language was too complicated for me to learn and I've been doing all my programming in Basic, or buying software that doesn't do quite what I want. You know, Basic is just too slow for a lot of tasks, and I can't find ready made software to do those specialized things I want to do.

Well, I just bought Panther's C64 Assembler and I found out that assembly language is easier than I thought, and it's also fun.

The C64 Assembler is very "friendly" and the documentation is clear and well written. One very nice feature of the manual is a section for the neophyte assembly language programmer that really helped me understand how to use the machine.

Now I'll be able to write those programs myself instead of waiting for some software manufacturer to guess what I'm looking for! My programs will do exactly what I want, and I'll have fun writing them.

The dealer even told me that Panther is looking for good programs in assembly language, and they're willing to publish and pay royalties for useful programs which meet their standards.

As you know, I don't have any experience yet, so I can't compare assemblers, but Jim's seen it and he's a professional assembly language programmer. He says it's the easiest-to-use and the fastest assembler he's seen for any microcomputer. In fact, he said he's going to buy a Commodore 64 just so he can use it.

Come on over to my place when you have time and I'll show off the assembler for you, or go to the dealer down the street to see it. The whole Commodore community is excited about the C64 Assembler.

I've got to sign off now. I'm anxious to get back to my assembler and finish the program I'm working on. This is fun!

Let's get together soon,

Bob

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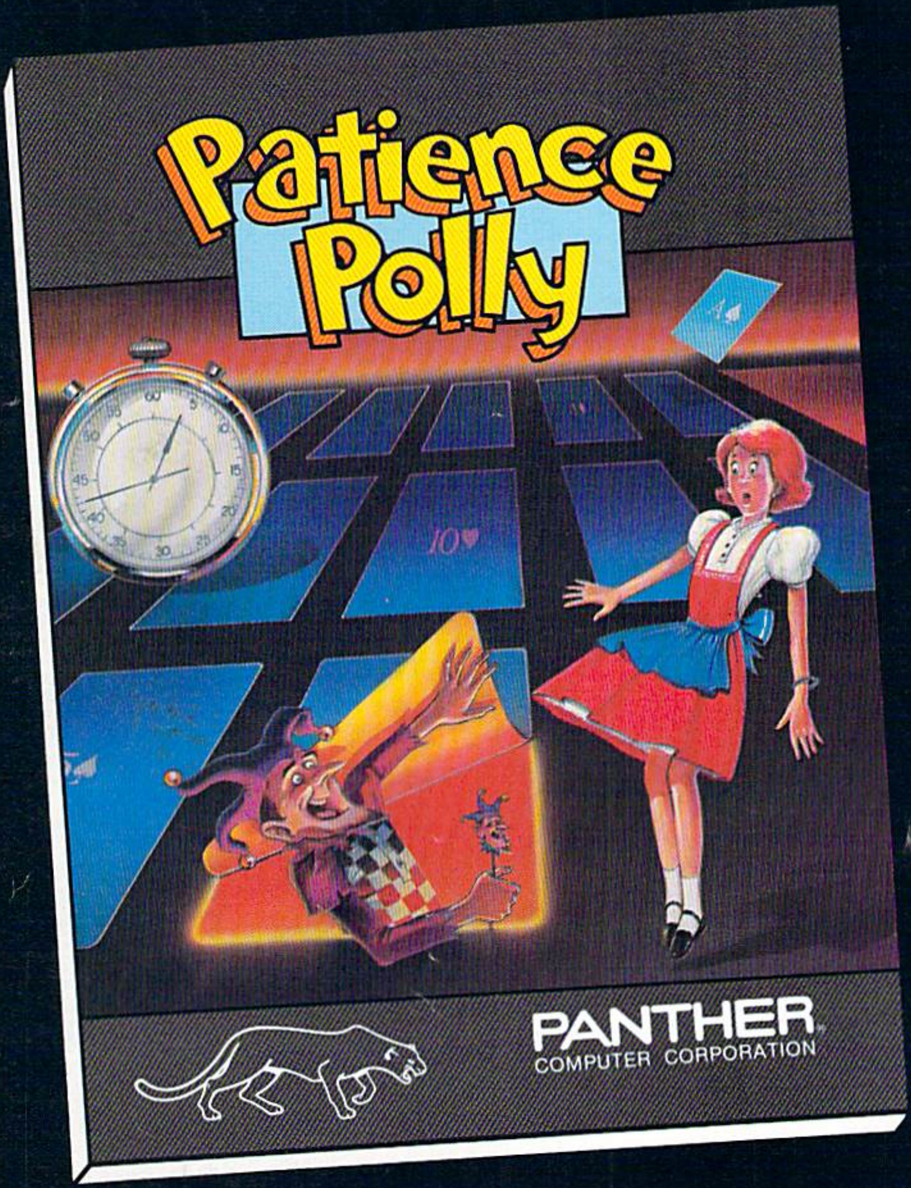

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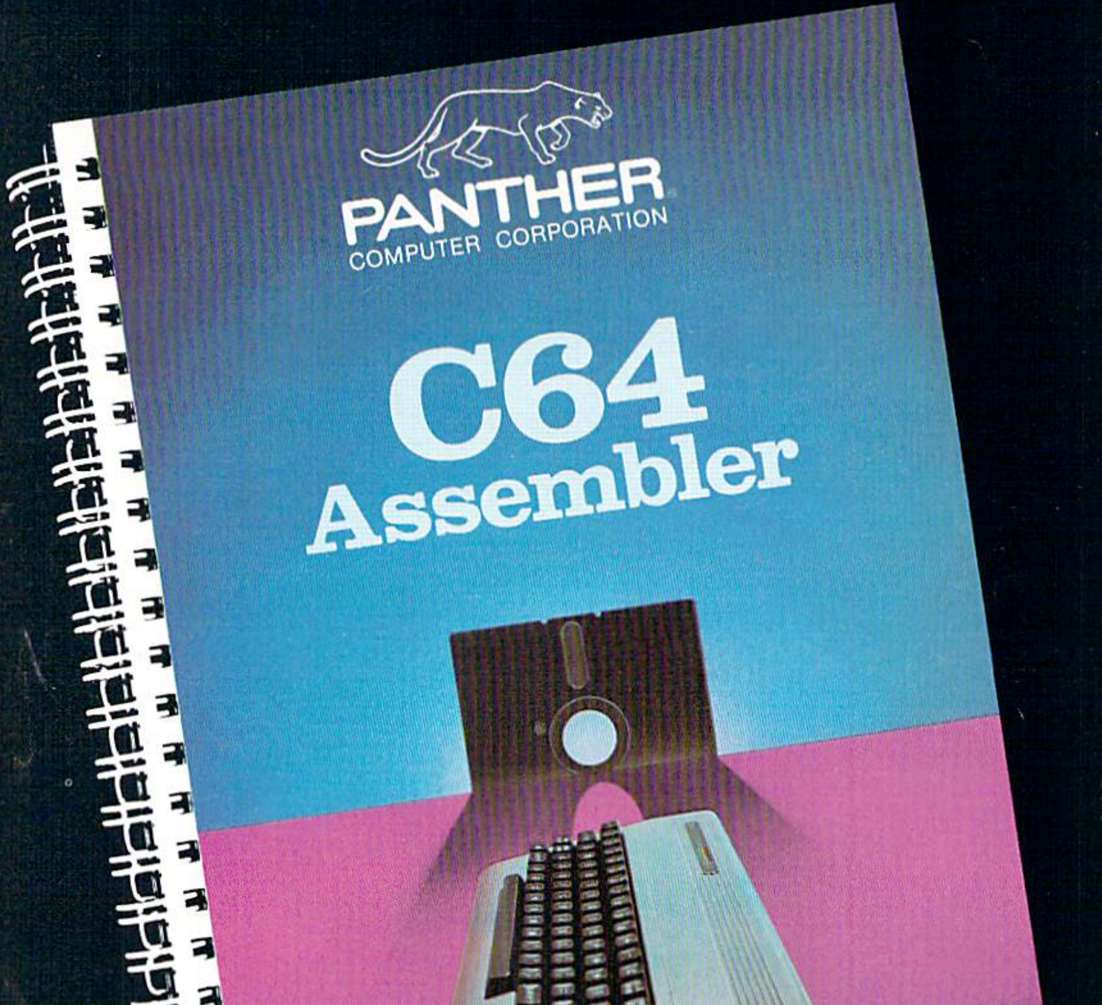
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RUNningRuminations

How Interesting Is Your Commodore?

Wanted: Unique Applications

What has your Commodore computer done for you lately? *RUN* magazine wants to know. We're interested in hearing how you have your VIC-20 or C-64 working for you.

Sure, you may have your system set up in the family room at home. You can probably fire up the latest game from your collection at a moment's notice. Maybe you have a printer hooked up to your system for word processing. You may be doing home inventory on your Commodore machine, or maybe even occasional budget analysis.

These are all fine applications, but surely Commodorists must be doing more with their machines.

I've heard of some truly interesting and imaginative applications for *other* systems: Heaths being used for home environment control; Apples used to control space shuttle flight experiments; TRS-80s running robots; IBMs finding a place in the mainstream outside the boardroom; and even an Osborne in Afghanistan used to report the guerilla war.

What about it, Commodorists? Can you match any of these unique applications? I know that teachers are finding the Commodore machines to be valuable aides in the classroom; let's hear about their uses. VIC-20s and C-64s are particular favorites among hams for their amateur radio applications; call in and be heard.

Perhaps you run a small business out of your home, or use your system to monitor energy usage in your home. Share your experiences with others through the pages of *RUN*. We want to know how our readers are using their systems.

Of course, not every application will be as exotic as the one we relate on page 52 of this issue (see "The Hypnotist"), or as extraterrestrial as last month's cover story (see "C-64: In Search of the Tenth Planet," March 1984, p. 42).

We're interested in applications in virtually all areas—home, education, science, personal management. Commodore computerists are always on the lookout for new ways to use their machines. Your articles may serve as a springboard for others.

For assistance with the preparation of such articles, send a self-addressed, stamped envelope to *RUN*, 80 Pine St., Peterborough, N.H. 03458, and we'll mail you a copy of the magazine's author's guidelines. As always, we invite your ideas, comments and suggestions. Let's keep the lines open.

A Challenge

RUN magazine has received many fine articles describing how users can select the possible text, border and screen color combinations offered on their Commodore machines. The articles include program listings—some several pages long—that allow you to do this. But there has to be a better way.

We're looking for the simplest, quickest program listing to display all the possible color combinations on the computer. And we're betting that it can be done in a half dozen—or fewer—program lines.

Well, programmers, there's your assignment for the month—six lines or less. Can it be done? Let us know. We'll publish the results of this challenge in a couple of months.

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RUN Wants You!

We're not looking for just a few good articles. We're not even looking for a lot of good articles. We are looking for a lot of *great* articles! You have them and we want them! *RUN* magazine is going to be the best magazine ever for the Commodore 64 and VIC-20. We have a little ways to go, and we need your help. Send us that clever programming technique you stumbled upon, that fantastic game you designed, that utility program that is going to revolutionize the way people use their computers.

Write it down! Mail it to us! We pay *real* money for articles *if* they are good enough.

What sort of articles? Any and everything under the Commodore sky.

You and your computer have gone through a lot together, and you must have learned quite a few things along the way. Share that knowledge with the rest of us.

What sort of unique tricks, styles, applications, experiences did you pick up on the way to where you are now? What do you do with your Commodore 64 or VIC-20 that no one else does? What programs have you written that are really marvelous?

Basic programming or programming in Basic, humor or satire, cartoons or games, assembly language or assembling projects, tips, trips, high scores, numbers, user groups, sorts, soups, nuts, facts and even fictions.

Send your submissions to:

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For a copy of the *RUN* author's guidelines, send us a self-addressed, stamped envelope.

How to type listings from RUN magazine

Typing in listings can be difficult enough without having to worry about strange graphics characters, charts or tables. That's why we decided to make it easy to enter listings from RUN by translating everything we thought might be confusing in any program.

When you see something between the curly brackets, all you have to do is press the keys indicated. For example:

{SHIFT L}—means hold down the shift key and press the L key at the same time.
{COMD J}—means hold down the Commodore key (it is on the lower left side of the keyboard) and press the J key at the same time.
{SHIFT CLR}—hold down the shift key and press the CLR/HOME key.
{HOME}—press the CLR/HOME key without shifting.
{CTRL 6}—hold down the control key and press the 6 key.
{FUNCT 2}—function 2 (in this case, you hold down the shift key and press the function 1 key).
{CRSR UP} {CRSR DN} {CRSR LF} {CRSR RT}—these are the four cursor directions.
{UP ARROW}—means the arrow key (the one with the pi sign under it).
{LB.}—the British pound sign (£).
{PI}—the pi sign key (π); (shift and press the up arrow key).

In some instances, when a large number of characters or spaces are repeated in a listing, we will represent them this way: {22 spaces} or {17 CRSR LFs}.

We hope this system will make it easier to enter the listings without having to remember or refer to any charts or conventions. If you have any suggestions as to how we might improve the system to make it even easier, drop us a letter.

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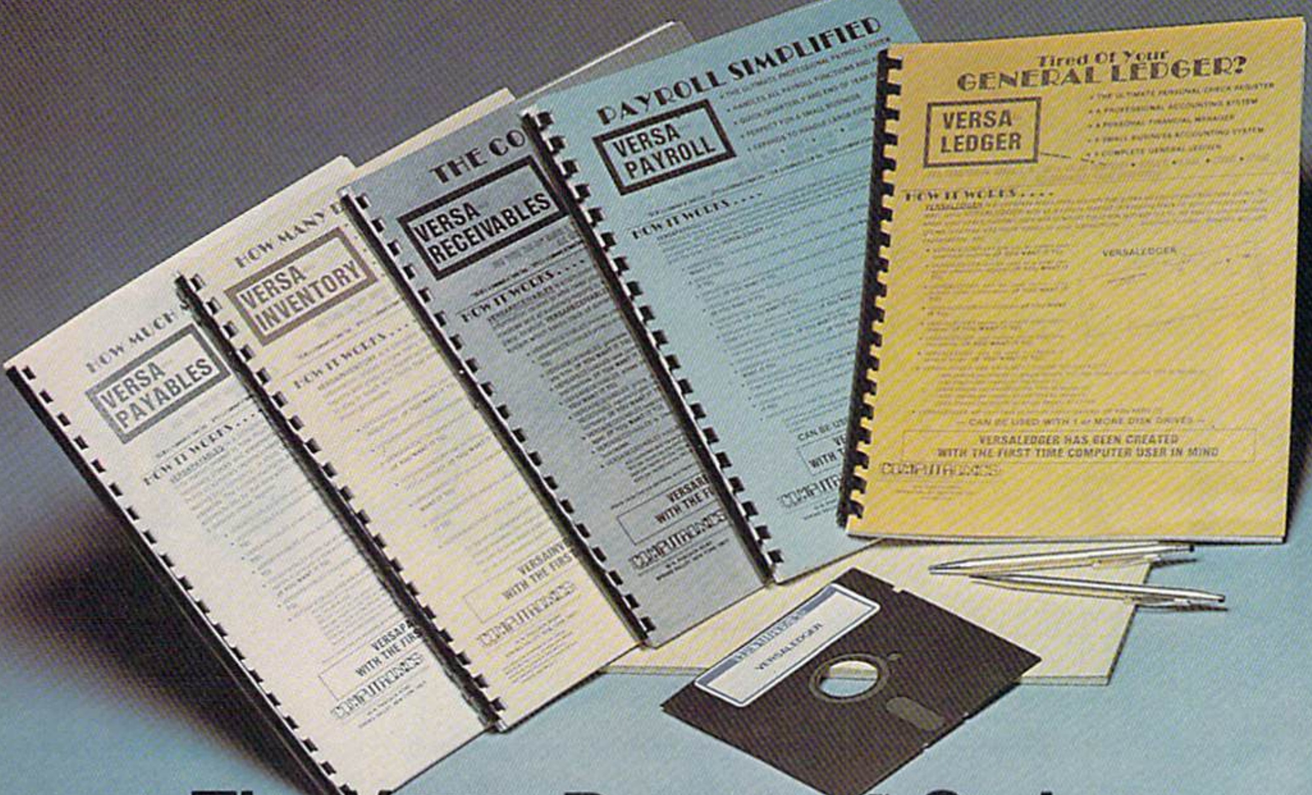

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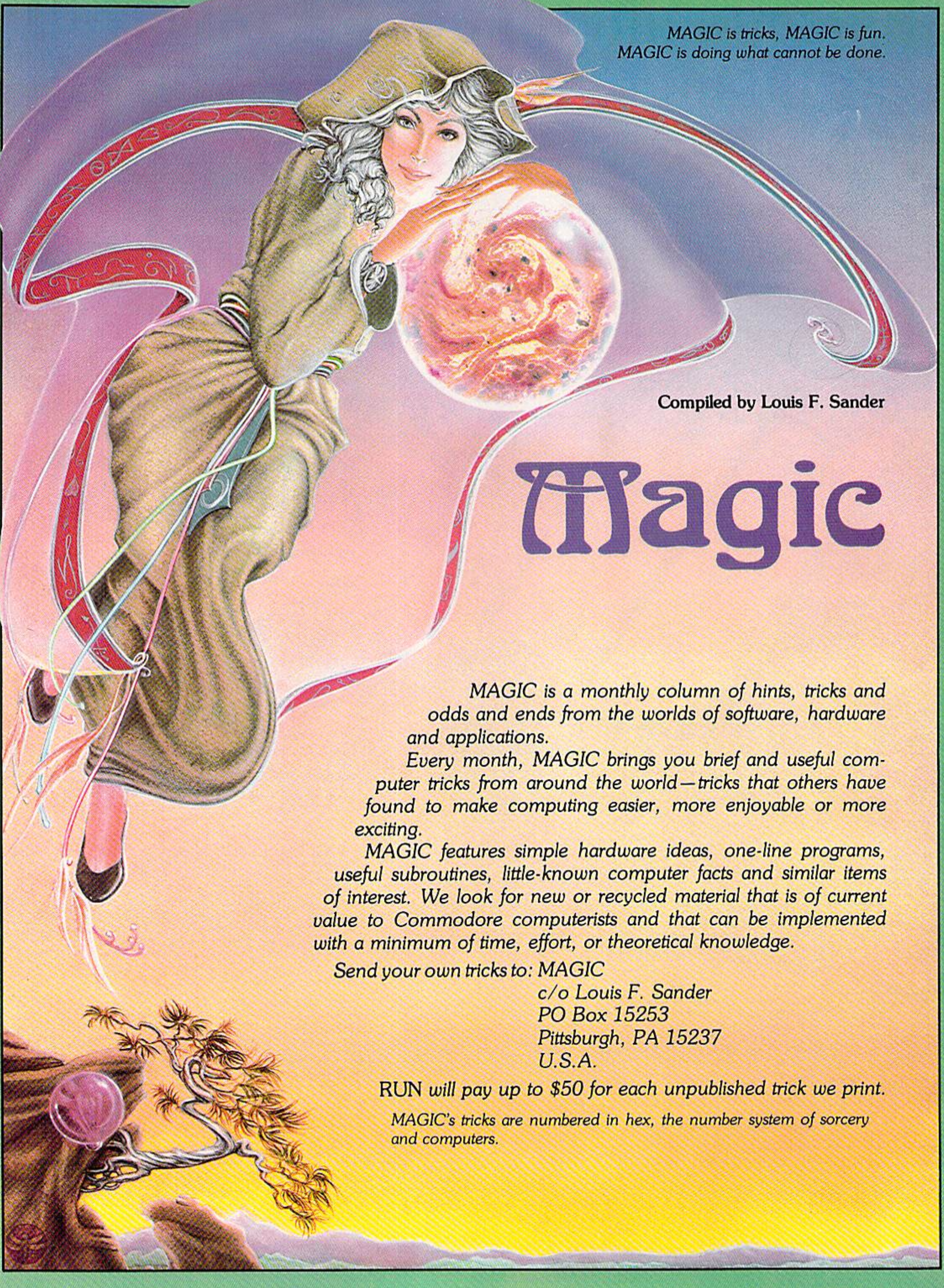

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Compiled by Louis F. Sander

Magic

MAGIC is a monthly column of hints, tricks and odds and ends from the worlds of software, hardware and applications.

Every month, MAGIC brings you brief and useful computer tricks from around the world—tricks that others have found to make computing easier, more enjoyable or more exciting.

MAGIC features simple hardware ideas, one-line programs, useful subroutines, little-known computer facts and similar items of interest. We look for new or recycled material that is of current value to Commodore computerists and that can be implemented with a minimum of time, effort, or theoretical knowledge.

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RUN will pay up to $50 for each unpublished trick we print.

MAGIC's tricks are numbered in hex, the number system of sorcery and computers.

This month, most of our tricks are for handling magnetic media and for typing and using the keyboard. These topics are of widespread interest, and of course our readers are dealing with them in *most* creative ways.

A veritable river of tricks is flowing into our box, and from what we can tell, readers really appreciate this part of the magazine. If you'd like to see your own trick in *RUN*, send it in and see what happens. We read every trick, and we print all the good ones we can find room for. MAGIC's Trick Writer's Guide, full of tips for authors, is available for an SASE.

$33 Reset buttons—One thing that many people like to add to the VIC and C-64 is a reset switch. The reset line comes out to several connectors on both machines, and if you rig a momentary switch to ground it, you'll have a reset button. The preferred approach is to wire the switch to a separate connector, which you plug into the machine as needed. The undesirable alternative is to solder a switch directly to the computer. This may make it hard to get repair service, should you ever need it.

Resetting either machine restarts it with the familiar bytes free message, which you see when you first turn on your computer. Basic's pointers are reset to their power-up values, but user memory isn't disturbed. So a reset gets the computer out of any bizarre states you've put it in, and gives you a chance to recover your program. You have three choices on connecting the switch.

First, on either machine, between pins 2 and 6 of the serial I/O port. This is a good choice, because the connector can be inserted only one way, and because this port is available on the computer *and* on the disk drive, if one is connected.

Second, on either machine, between pins 1 and 3 of the user I/O port. This is less desirable because some user port connectors can be inserted upside down, wiring your switch to an unintended, potentially disastrous, place.

Third, between pins A and C of the C-64 expansion slot, or between X and Z of the VIC expansion slot. Depending on your connector, this method may or may not share the hazards of the one above.

Tom Hoppe
Spokane, WA

$34 More on connectors—Radio Shack stores carry two blank circuit boards that fit the VIC's expansion port: #276-152 or #276-154, each selling for under $4. The #276-1551 is a matching 44-pin, 22-position socket, and you can make a nice motherboard by mounting several of them on one of the blank boards.

If you don't have a local source for user port or cassette connectors, you can cut up a #276-1551 and make an acceptable substitute. Use a hacksaw, and carefully cut off a 12-position section from one end and a 6-position section from the other. Discard the extra 4-pin section, which will probably be rather hacked-up anyway. If you use care in inserting your new single-ended connectors, they can give good service until you locate something better.

Dick Halapin
Apollo, PA

$35 Cassette tip—There is no need to advance your cassettes past the plastic leader before doing a Save. Commodore computers start every Save by recording ten seconds of programless leader tone, allowing plenty of time for the magnetic part of the tape to appear in front of the record head.

Thomas McClary
Hollywood, CA

$36 Cassette loading—If you are getting numerous Load errors when trying to load a tape, try moving the datassette farther away from the computer and monitor. It may put an end to your troubles.

Richard D. Bailey
Bronx, NY

$37 Tape library hint—Saving different types of programs on the same tape can lead to a lot of searching for the right tape and program. Try saving one type of program on one tape, and a different type on another tape. For example, reserve one tape for games and another for home-financial programs. This technique will help you find and load your programs much faster. You will also enjoy seeing your program collection grow while feeling organized.

Stephen Morse
Northfield, MA

$38 Disk hint—If a floppy disk has been exposed to cold temperatures for any length of time, it must be allowed to slowly warm to room temperature. If you record on a cold disk, you may not be able to read it when it is warm. A prerecorded disk may also cause problems when cold. Always allow your disks to warm slowly to room temperature, never using any sort of artificial heat source. You should use similar precautions with disks that have become overly hot for some reason.

Tom Skantar
Pleasant Unity, PA

$39 Disk care—To help prevent damage to your disks (dust, smoke, spills, etc.), store them individually in Ziploc sandwich bags. These bags are waterproof and transparent, and their small cost is well worth the protection they give.

Ed Moore
Portland, ME

$3A Disk storage—K-Mart and other stores have a $2 plastic 8-track tape storage box that nicely holds up to 60 disks. The box has a 4½- × 12-inch opening, and two rows of disks will fit perfectly if they are inserted crosswise to the direction intended for the 8-track tapes. There's also a plastic lid to keep the dust out. The K-Mart stock number for the box is C-12 or XC-12, and it's made by Soho Corp., P.O. Box 20081, Ferndale, MI 48220. If you can't find the box in your local store, ask the manager to get it for you. If that fails, write to Soho and ask for the name of a local dealer (they don't sell to consumers).

Tom Reigle
Shattuc, IL

$3B Disk flipping—It is possible to use both sides of a disk, if you're willing to cut a new write protect notch and to take a few chances with reliability. Disk drives read the bottom side of the disk (the unlabeled side), and disk manufacturers test and guarantee the quality of the magnetic coating on that side.

The top side of the disk is also coated with magnetic material, and even though it isn't guaranteed or tested, in many cases it works perfectly well. The only thing that prevents you from using it is the absence of a write protect notch in the proper place. If you cut one with a razor blade or sharp scissors, *voila*!, you have a flippable floppy disk. It's good to use a second disk, flipped over, as a template for cutting the notch. The new notch goes just opposite the old, in the area where the manufacturer's label is usually placed. To use the top side of the newly-notched disk, just insert it upside down into your drive (oval read-slot first, manufacturer's label downward).

There *are* some warnings. It's possible that your new disk surface has some flaws in it, and if it does, it's likely that you'll lose some data. Also, flipping a disk changes its direction of rotation with respect to the jacket, possibly releasing some of the contaminants the jacket has scrubbed from the magnetic surface.

Disk manufacturers advance these and other reasons against flipping disks. Computerists often successfully disregard them. It's up to you to decide whether the saving is worth the risk, and to act accordingly. After all, when you dabble in magic, you also dabble in *danger*!

David William Vernham
Michigan State University

$3C

Locking disk files—Program and data files on a Commodore disk can be locked against accidental deletion or modification by using the Rename command to add a shifted space (represented here as –) as the first character of the filename. The unexpected result is that in the disk directory "–FILENAME" will become ""FILENAME. Attempts to scratch "FILENAME" will produce a File Not Found error, while attempts to scratch ""FILENAME will give an Illegal Quantity error, preventing the file from being scratched. The same holds true for all other disk commands, except those using the wild card (*), which will, of course, match anything. The locked program or file can be loaded by including the shifted space in the filename: LOAD"–FILENAME",8. It can be unlocked by renaming it and deleting the shifted space. This trick works on all Commodore disk drives, and with all Commodore computers.

Garold R. Stone
Annapolis Jct., MD

$3D

Key sensing—Memory location 653 can be used to sense the status of three non-printing keys on the VIC or C-64. The usual value in 653 is zero, but it changes when these keys are depressed:

shift key = 1
Commodore key = 2
CTRL key = 4

The values are additive; Shift/CTRL will generate a five, Shift/Commodore, a three and so on. You can examine this feature in detail by typing:

```
10 PRINT "[clear]"PEEK(653) : GOTO 10
```

Run the program and press the various keys.

Quyen N. Truong
Address unknown

$3E

Keypress detection—The content of memory location 197 is determined by the key that is pressed at any given instant, and that fact can be used to advantage in programming. If no key is pressed, PEEK(197) = 64. Other keys change the Peek, but to different numbers on the C-64 and VIC-20. Table 1 gives the values for both machines. If several keys are pressed at once, 197 will respond to the key with the highest value in the table. Memory location 203 holds the same value as 197, so you can use the two interchangeably.

Notice that these locations don't respond to the shift, control, Commodore, or restore keys.

Tom Hoppe
Spokane, WA

$3F

SAVE@ replaced—The 1541 disk drive's Save and Replace command (SAVE"@0:NAME") is useful when you are developing a program, because it lets you save successive versions of the program without changing its name each time. Unfortunately, the Save@ command has a bug that occasionally causes some *other* file to be replaced with the updated program. One solution is to avoid

KEY	C-64	VIC	KEY	C-64	VIC	KEY	C-64	VIC	KEY	C-64	VIC	KEY	C-64	VIC
A	10	17	N	39	28	1	56	0	←	57	8	f1	4	39
B	28	35	O	38	52	2	59	56	+	40	5	f3	5	47
C	20	34	P	41	13	3	8	1	–	43	61	f5	6	55
D	18	18	Q	62	48	4	11	57	£	48	6	f7	3	63
E	14	49	R	17	10	5	16	2	@	46	53	SPACE	60	32
F	21	42	S	13	41	6	19	58	*	49	14	RETURN	1	15
G	26	19	T	22	50	7	24	3	↑	54	54	STOP	63	24
H	29	43	U	30	51	8	27	59	:	45	45	HOME	51	62
I	33	12	V	31	27	9	32	4	;	50	22	DELETE	0	7
J	34	20	W	9	9	0	35	60	=	53	46	CRSR DN	7	31
K	37	44	X	23	26				,	47	29	CRSR RT	2	23
L	42	21	Y	25	11				.	44	37	NO KEY	64	64
M	36	36	Z	12	33				/	55	30			

Table 1. Values of PEEK(197) for various keys on C-64 and VIC-20.

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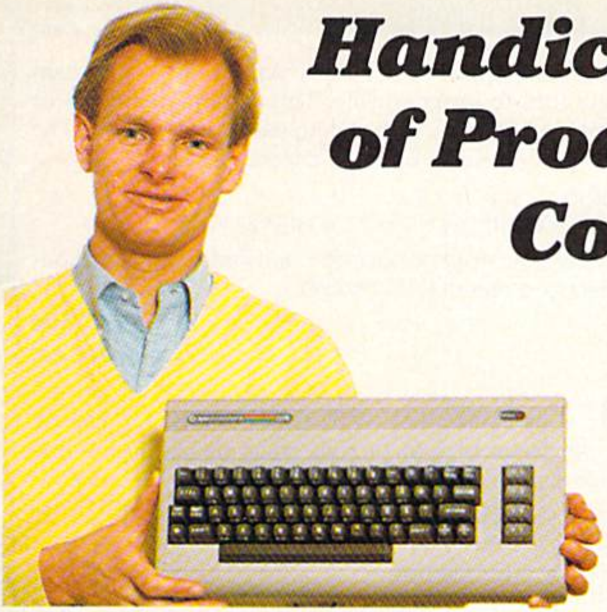

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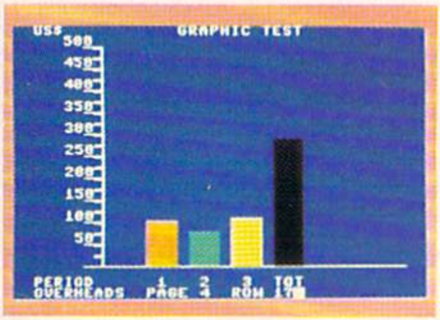
US$
GRAPHIC TEST
500
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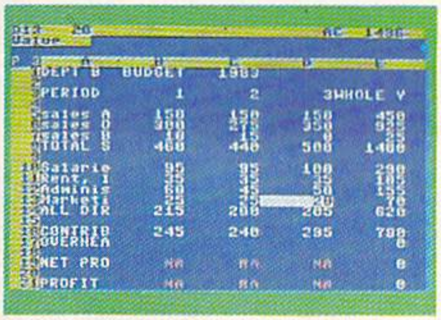
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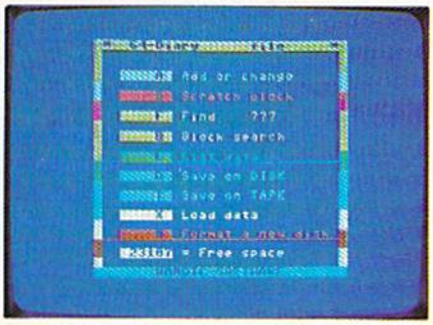
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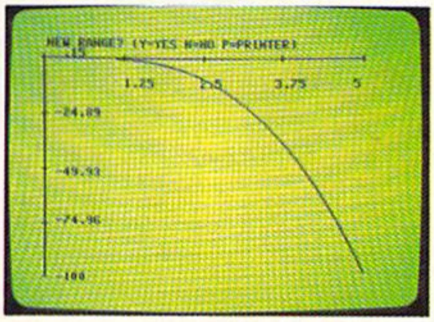
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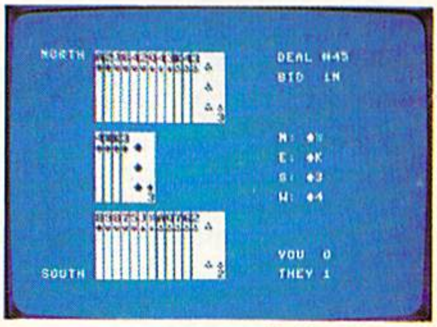
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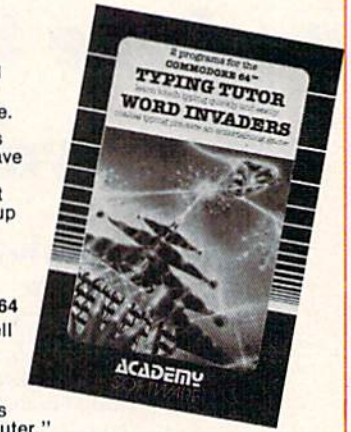

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the Save and Replace function—to scratch the old program first and then to save normally. This requires quite a bit of typing if a program is being updated very often. The following routine avoids the typing and the bug.

```
59999 END
60000 OPEN 15,8,15,"S0:NAME":CLOSE15:SAVE"0:NAME",8
```

Whenever you want to save the updated version of your program, just enter GOTO 60000.

Jack Ryan
El Dorado, AR

$40 C-64 control key—The C-64's CTRL key can be used with letter keys to provide some interesting results. Here are some examples:

CTRL-H	Disable case switch
CTRL-I	Enable case switch
CTRL-N	Switch to lowercase
CTRL-R	RVS ON

(Case switch is the ability to switch upper/lowercase with the shift and logo keys.)

If you look at the table of CHR$ codes in your user's manual, you'll be able to see what's happening. CTRL-A is equivalent to CHR$(1), CTRL-B to CHR$(2), etc. Since N is the 14th letter of the alphabet, CTRL-N is equivalent to CHR$(14). The technique works for CHR$(0) through CHR$(31), and can be useful in sending control codes to printers, modems and the like.

Eric Sink
Morris, IL

$41 Disabling STOP, etc.—Many people have written about their ways of disabling the stop key and other features. We want to pass them along to you, but we'll precede them with a caution: Anything involving Pokes to locations in the operating system also involves a risk of unwanted side effects and possible system crashes. We've tested these tricks, and they seem to work fine, but be aware that they may play tricks of their own under some circumstances. In other words, we're talking strong magic here. For the VIC-20:

POKE 808,114 disables the stop key, but the stop/restore key combination continues to work.

POKE 808,100 or POKE 808,127 disables Stop, *and* Stop/Restore *and* List.

POKE 808,112 returns the above to normal.

POKE 818,73 : POKE 819,245 disables the Save command. Stop/Restore, unless disabled as above, enables Save again.

POKE 775,0 disables the List command.

POKE 775,199 enables it again.

For the C-64:

POKE 808,239 disables the stop key, but the stop/restore combination continues to work.

POKE 808,225 disables Stop *and* Stop/Restore *and* List.

POKE 808,237 returns the above to normal.

POKE 775,200 disables the List command.

POKE 775,167 enables it again.

L.F.S.

$42 Keyboard disable—On VIC or C-64, POKE 649,0 will disable the keyboard until a POKE 649,10 enables it again.

Doug Speta
Springfield, IL

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Commodore Clinic

By Jim Strasma

Commodore clinic is a regular monthly column designed to help you, the RUN *reader, through any troubles or questions you have as you use your new VIC-20 or C-64 computer. Mail questions (please don't phone) to:*

Jim Strasma
Commodore Clinic
1238 Richland Ave.
Lincoln, IL 62656 USA

(Also include a stamped self-addressed reply envelope if you would like a personal reply.)

Hardware

First, the question you've all been asking:

Q: **Where's the Speed-up ROM you mentioned in *RUN*'s premiere issue?**

Mel Agne
Baltimore, MD

A: I'm sorry to report that the new Speed-up ROM...doesn't. A new ROM is in all of the 1541s that have been shipped recently, but I've been unable to detect any speed increase as a result. On the other hand, the new drives do work rather well compared to earlier ones. Commodore is apparently not selling the new ROM (which may be part #901229-05AE) separately yet. Since it comes as an EPROM, your dealership may be able to get permission to duplicate it until it can be bought.

Q: **Could the C-64 be used as a real business machine and be left on all the time?**

Herb Gross
Elgin, IL

A: Yes, we're using one in a thousand-member church. We also leave our home system on several hours every day. However, for business use you must use it with a good dual disk drive, such as the 4040, 8050 or 8250.

Q: **I am soon to be assigned to Europe. Do you know of a 220 V/50 Hz transformer for the C-64? If not, would a 220 VAC to 5 volt dc power supply work?**

Ron Moore
Ft. Huachuch, AZ

A: Commodore sells 64s just as quickly in Europe as here. I expect all you'll need when you arrive is a new power supply, which shouldn't cost too much. But do stick with an official one. It handles more than just 5 volts.

In a pinch, you can just step down the line voltage from 220 to 110 volts, and use your current power supply. The 50 Hz correction in the CBM models was left out of the 64, so it may not be a problem. A more serious hassle is the TV; European standards differ from ours. To use your 64, you may have to take along a suitable monitor.

I'd suggest writing Commodore Britain at The Commodore Information Centre, 675 Ajax Ave., Slough, Berkshire SL1 4BG, England, or phoning them at (0753) 79292.

Q: **When I hold a light pen, which I constructed, to the screen in one spot, the Y values remain constant, while the X values range up or down by 15 over a one second interval. Why? Will software written for other light pens work with mine?**

Also, do you have a formula for changing the X,Y coordinates into screen locations on the 64?

Keith Spencer
Groves, TX

A: Your experience is typical of the 64's resolution with inexpensive light pens. Newer 64s may do better than older ones, due to a revised VIC-II chip, but truly usable resolution requires a light pen that costs almost as much as a 64. The only truly accurate light pen I've seen that you can buy is Flexidraw, from Inkwell Systems of San Diego, CA.

The Flexidraw programs do *not* work with other light pens, but simpler programs should, as long as you don't mind only being able to choose accurately among rows rather than columns on the screen.

Here is Cardco's Cardwriter algorithm for converting X and Y to a screen location:

```
LC=SS+SW*INT((Y-LY)/DY)+INT((X-
LX)/DX)
where SS  =  screen start: 1024 (7680 or
             4096 on VIC)
      SW  =  screen width: 40 (22)
      LY  =  low Y value: 50 (24)
      LX  =  low X value : 45 (34)
      DY  =  dots/Y location: 8 (4)
      DX  =  dots /X location : 5 (4)
```

Q: **When using the restore key with the stop key (to force a non-maskable interrupt and warm start of Basic), it is necessary to strike the restore key a rather heavy blow to obtain a response. All of our 64s exhibit this. Why?**

R.C. Tilby
Tahlequah, OK

A: Unless something has recently been changed, nothing on the 64's keyboard should require abuse to work. Inside each key is a spring, and below that a conductive foam pad. This pad, when the key is pressed, shorts out two open contacts on a printed circuit board at the bottom of the keyboard assembly.

In our experience, two things go wrong with keys to make them fail. First, there may be junk between the foam and the circuit board. Cigarette smoke and cracker crumbs are typical offenders; once I even found some leftover masking tape. Second, the foam itself may deteriorate with use. The cure for either requires a full disassembly of the keyboard unit (thoroughly voiding your warranty). If dirt is the culprit, clean it out with a jet of air or an alcohol swab. If the pad is failing, remove the key and either replace it or rotate the spring unit 180 degrees. This usually works.

In your school environment, heavy use and some beating on the keyboard is likely. I'd suggest you limit other sources of trouble by banning smoking,

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food and drink from the computer classroom.

One final thought—since you cannot continue a running program after pressing the restore key, it may be just as well to have to press it firmly.

Q: I wish to connect a surplus keyboard to a VIC. Could you print a schematic of the VIC keyboard? How would a number pad be wired in?

Peter Michalopoulos
Cumberland, RI

A: I did this once, five years ago, to a PET computer. Never again! The VIC already has an excellent keyboard. But if you insist, the keyboard is basically a square matrix of 8 rows and columns. When you press a key, one row is connected with one column. Sixty times a second, the computer watches for this and translates the event into the proper character. To add a separate keyboard or keypad, just use a continuity tester to figure out which row and column are mated by a desired key, and hook up a key on the added keyboard to the same row and column. It's tedious, but the only difficult part is figuring what to do with the rat's nest of wires when you're done.

Q: I would like to know what changes are needed to make a Tandy TP-10 thermal printer compatible with the VIC or 64.

Peter Michalopoulos
Cumberland, RI

A: The TP-10 is a 600 baud serial printer for the Color Computer. To hook it to a Commodore will either be as easy as connecting a 3-wire cable from a Commodore 1011 serial interface, or as difficult as controlling the 1525 printer from a Color Computer. I'd suggest looking into similar printers specifically for the VIC and 64, such as the one Alphacom is advertising.

Q: Can a Supercord interface to the C-64 be used with a three year old Smith Corona Typetronic typewriter that has no computer port?

Keith W. Klarin
Shrewsbury, NJ

A: The Supercord interface to current Typetronics has two parts: a board that goes into the typewriter box and a box connected to the board on one end and to the 64's user port on the other. However, connecting via the user port may be a bad idea. Only one of the text editors (TOTL.TEXT), which I recommend, works with the Supercord interface.

Far better would be a substitute that attaches to the serial bus used by Commodore's own printers. Unfortunately, Supercord does not offer that option, and we know of no alternative interface to the Typetronic. With the price of printers dropping rapidly, you may find it cheapest to buy a new printer that plugs directly into the 64's serial bus, such as Cardco's LQ-1.

Q: I use a modem to hook a 64 to a VAX supermini system at Marshall University. Is there any way to print my VAX files on a Commodore printer through my 64 and modem?

Alan Burns
Proctorville, OH

A: The new SuperTerm terminal emulator package from Midwest Micro, Inc., should be able to handle most of that, when combined with their smart ASCII printer cable, but on an ASCII printer, not a Commodore one. If your files are small enough to fit inside the 64 at once, several terminal programs copy the file to a RAM buffer as received, and then dump it to your printer all at once at the end.

Software

Q: Have there been any business studies of how much a good software warranty (1 year or more) costs a company? Have your full warranty costs been significant?

Herb Gross
Elgin, IL

A: We've seen no studies, but find it interesting that the single most successful Commodore supplier in the past year, Cardco, is almost the only one to cover its products with a lifetime full warranty.

As for our own costs, we have to rerecord an occasional disk that is dead on arrival, something most reputable companies would do anyway. We feel strongly that the only companies who need to fear good warranties are those that don't put the customer first. Long run profitability requires repeat business. That, in turn, requires satisfied customers, warranty or no.

Q: Is there any program for the C-64 to facilitate learning German?

Clarence Jorgensen
St. Augustine, FL

A: The only German programs I've seen have been from Germany, and they haven't been language lessons. However, many of these are very good, as Commodore has been the dominant computer in Germany for several years. If you would seriously like to learn German via computer, write again, enclosing airmail forwarding postage, and I will pass the note you send on to one of *Midnite*'s German readers.

Q: Is there any way to tell if a commercial disk-based program is not reproducable before using the 1541 backup? Will repeated insertions and removals shorten the lifetime of the disk?

Stan Goldrich
New York, NY

A: If a commercial program is copy-protected, most reputable firms say so, either on the disk label or early in the program manual. A full service dealer will also usually know. Our *Midnite* reviews now try to list whether programs are copy-protected. Perhaps reviewers for *RUN* can also keep your question in mind.

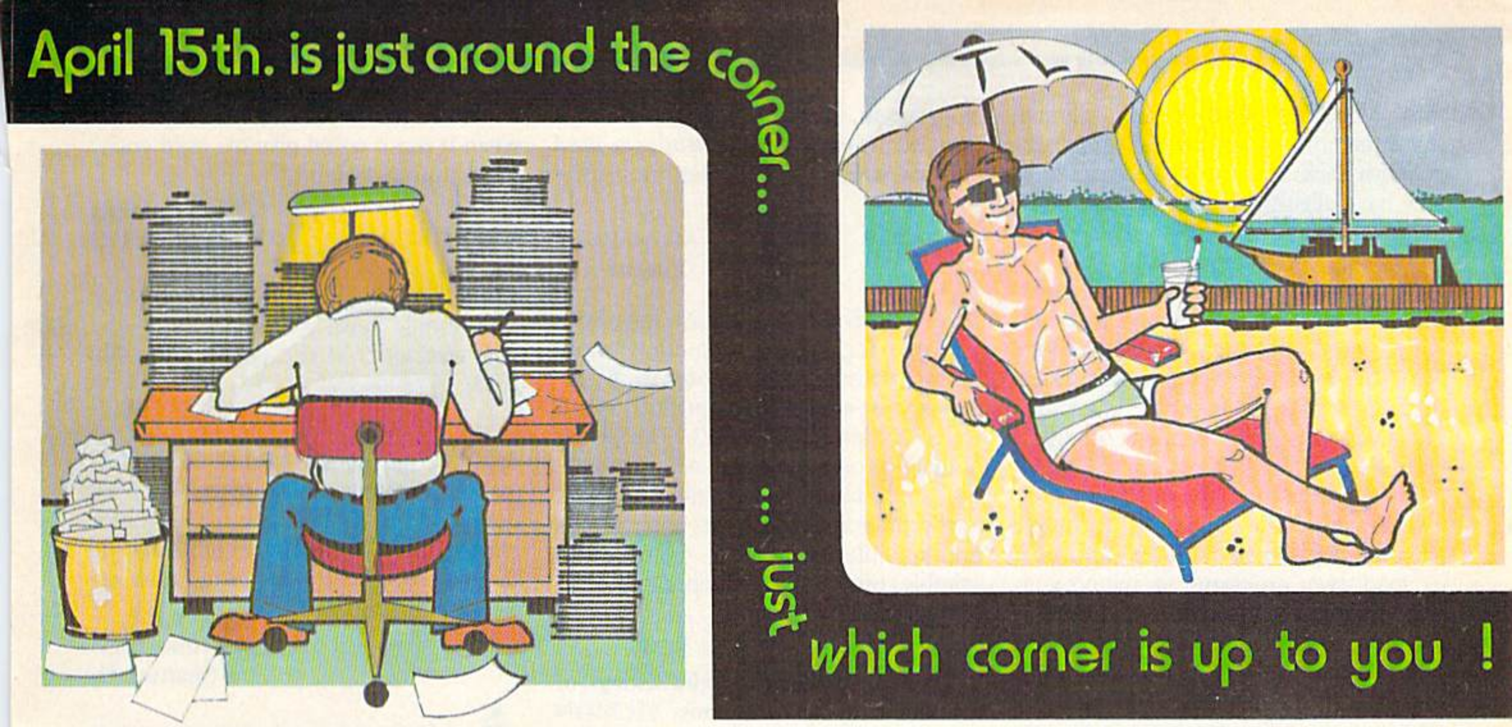
As for ways to check, try loading the directory first. If it looks at all unusual, odds are the disk has been protected. Similarly, try loading the program normally and listing it. If you can't, that's a big clue. Beyond that, don't mess. Most other things you could do might be interpreted by the program as attempts to break it, and the program may self-destruct.

Any wear will shorten the life of a disk a tiny bit. That's why it's good to check on the price and availability of spare disks when buying important programs.

Q: What is the Poke to load one program without wiping out another already in memory?

Dennis Hallingstad
Sparta, WI

A: The programmer's aid, Power 64, has an especially good command for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this. MRG lets two Basic programs share memory at once without interfering with each other at all. Several other aids have slightly similar Append commands that tack new programs on to the end of an existing program.

Another way to load a second program is from within a machine-language monitor, such as Micromon. Monitor loads don't change Basic's program pointers as Basic loads do. However, programs can still interfere with each other if they use the same memory locations.

There are two regions of memory: program and screen. Thus, it is possible to load two programs in memory at once, one in main memory and one on the screen. By editing the one on the screen to have different line numbers, it may be added to the one in memory by simply running the cursor up to its corrected lines and pressing the return key.

At least two other methods (fooling the cassette pointers and re-entering via the dynamic keyboard method) also work, but are tedious and likely to go awry. I won't try to explain them here.

Q: Do you know whether Commodore's Manager is compatible with Wordpro? How does it compare with Delphi's Oracle?

Patrick McNamara
Washington, DC

A: The 8032 version of the Manager is fully compatible with Wordpro, and even allows you to load Wordpro from within the Manager. Just send your Manager output to a sequential disk file, and read that back into variable blocks (Control-B) in Wordpro. The same should be true of the newer 64 versions.

As for Manager versus Oracle, both are among the very best data managers, and are cross-town rivals in the Toronto, Ontario area. To decide between them, choose on the basis of either price or a special feature you need. For instance, the Manager is partly in Basic, making it slower than Oracle in some chores, but allowing you to customize it somewhat.

Programming

Q: I need a mini-program I'm incapable of writing because I would have to use a lot of assembly language, about which I know nothing. I term this needed program, Screen Dump To Printer. I want to be able to give students hard copy of screen displays that are helpful to them.

Marge Paulie
Eugene, OR

A: Several of these have long been available for some Commodore models. Try your local user group. One contact in your area is John Jones, 2134 NE 45th, Portland, OR 97213. The public domain program, Basic Aid, includes just the command you want—I added it to the program some years ago. Several printer interfaces also come with suitable programs optimized for specific printers.

Q: I would like to print listings of machine language programs. VICMON offers no command for this. I tried typing OPEN 4,4:CMD 4 but when I transfer control to VICMON, the printout stops. Any suggestions?

Paul Scheib
League City, TX

A: The problem is probably in the way you are transferring control to VICMON. To avoid potential software disasters, Commodore's recent Basics disable any active CMD when executing a BRK from Basic. To preserve your CMD mode, you must find the Call entry to VICMON and SYS to it from Basic. There are two entry points into a normal CBM cartridge like VICMON: a cold start when the computer is first turned on, and a warm start for when you press the stop and restore keys at the same time. One or the other should work for you. The needed addresses are stored at $A000 (cold) and $A002 (warm).

Try these lines of Basic to track down the needed address:

```
100 ? “COLD =”;PEEK(40960)+256 * PEEK
(40961)
110 ? “WARM =”;PEEK(40962)+256 * PEEK
(40963)
```

Then try a SYS call to those addresses. If either gets you into VICMON, try it again after OPEN 4,4:CMD 4. If that doesn't work, give up and switch to VIC Micromon, available from user groups. Micromon has a P command that handles the whole job.

Q: I finally typed in Screen Copy, a program in the 1525 manual. Next, I appended it to my own program, so that when it ran it could give me hard copy. Then nothing! Help!

Greg Rummel
Washington, DC

A: The CAPE user group in your area should have a suitable program. One contact is Mike Spengel (703-920-0513).

Q: I am curious about SYS commands. What are they exactly, and how does a person find out the function of a particular SYS number? Similarly, is there a listing of Pokes, giving their location and function?

Tom Reigle
Shattuc, IL

A: SYS commands function much like GOSUBs, except that instead of going to a certain line in Basic, SYS leaves Basic entirely, and goes to a particular address inside the computer, expecting to find a suitable machine language program to run there. If that machine-language program ends with an RTS command ($60), your program will resume with the Basic statement following the SYS, just as if it had come back via a return statement within Basic.

The beauty of both SYS and Poke is that they give you more intimate control of your computer than Basic alone allows. The price you pay is having almost none of Basic's safeguards. Although it is *very* difficult to hurt the computer from the keyboard, it is so easy to lose control of a Poke or SYS that you shouldn't use them in a new program without first saving the program.

As for lists of useful Poke and SYS locations, I am preparing a complete list for *RUN*. Commodore's *Programmer's Reference Guide* also includes a list of the best addresses for Pokes and SYS calls.

Q: How can I check for accuracy the Poke codes that are given in published tables, which usually contain errors?

Marge Paulie
Eugene, OR

A: First, simply try to use each location in the way described—if it works, it's probably right. If you understand disassemblies, you can also check SYS calls to see if the resulting

Continued on page 132.

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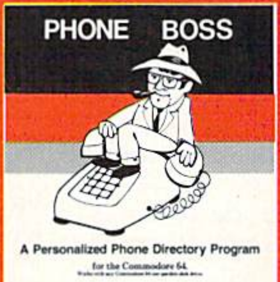
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For Gamesters Only

By Tom Benford

Hi, gang! This month we'll take a look at climbing games. Before we get into the reviews, I'd like to start you off with a strategy tip that applies to each of this month's games.

The Game's Got Rhythm

Timing is the single most important element in climbing games. Certain rhythms have to be followed in order to achieve high scores, and this is the principle difference between climbing games and shoot-'em-ups. In a shooting game, you can often just spray shots and "get lucky."

In a climbing game, you must observe the game's rhythms, whether that means the rate that objects are hurtling at you or the right moment to jump; such determinants make the difference between really enjoying the game and racking up a high score or getting frustrated as your computer buries you.

Try to observe what's going on in the game while you watch the playfield. Sometimes an audio prompt will foretell an approaching missile, and sometimes the event will happen at a more-or-less regular interval. By observing these telltale quirks, you'll survive longer on the playfield and achieve higher scores!

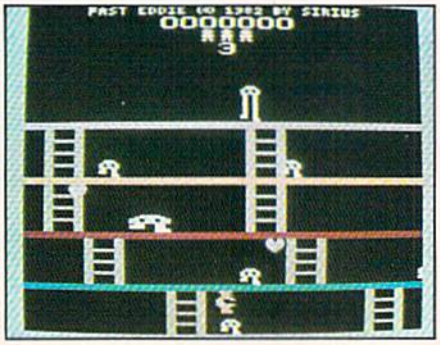
Let me also remind you, in case you didn't see last month's column, that I'm very interested in reading your comments, suggestions and items of interest. Drop me a line or two to let me know what you'd like to see in this column. Oftentimes, it's your feedback that leads to a feature article or product review in *RUN*. Send your cards or letters regarding this column to:

Tom Benford
PO Box 125
Osborneville, NJ 08723

Now let's get into the climbing games. Ready...set...jump!

Fast Eddie

(C-64 disk and VIC-20 cartridge from Sirius Software, 10364 Rockingham Drive, Sacramento, CA 95827. $34.95 disk, $39.95 cart.)



It isn't often that you see versions of the same game for both the VIC and the C-64 that are equally good, but Fast Eddie is one of those rare exceptions.

Because of the higher video resolution and expanded memory/sound capabilities of the C-64, the graphics are slightly better on this version. However, both the VIC and C-64 versions are excellent, with outstanding play action.

Play can be initiated through either the keyboard or a joystick, with the latter being the only serious approach to Eddie really being Fast.

The run/stop key on either machine will pause the game so you can answer the phone or whatever without crashing a game in progress.

There are eight play levels, and the objective is to manipulate Eddie around the four plateaus on the playfield. If you hit the fire button on your joystick, Eddie will jump to fetch one of the overhead prizes or to hop over one of the gremlins trotting around trying to get him. Some of the overhead prizes are stationary, while others stream across the screen.

After Eddie collects all the prizes from each plateau, you must move him up one final flight of stairs to the uppermost platform. Here, Eddie must grab a key, and, at precisely the right moment, jump up and insert it into the approaching gremlin robot to neutralize him.

Once you do this, you move to the next, more difficult level.

Each successive play level presents more obstacles for Eddie: some of the gremlins that were stationary on a previous level later run back and forth; ladders' locations vary; and prizes always appear in hard-to-get-at spots.

The play action is excellent, and though Fast Eddie is a simple game in concept, it's hard to really master it; continued play appeal is very high. Fast Eddie will really keep you on your toes!

Strategy Tip

Determine the gremlins' running patterns and how much time their cycles take. Adjust your timing to jump them or run up and down a ladder at just the right instant.

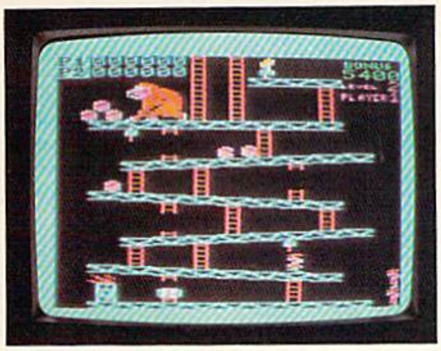
Also try to get a feel for the take-off point for running jumps and the timing necessary for a standing jump to avoid the gremlins and catch the moving prizes.

Donkey Kong

(VIC-20 cartridge from Atari, Inc., 1265 Borregas Ave., PO Box 427, Sunnyvale, CA 94086. $44.95.)

For those of you who've never played this arcade classic, I'll introduce the cast to you. The big monkey at the top of the screen is not Bonzo, and the little guy at the bottom is not Ronald Reagan. The hairy character is Donkey Kong and the other fellow is Mario. The girl? Oh, she's Mario's girlfriend, our damsel in distress.

The gorilla, beast that he is, has an eye for Beauty, so he kidnaps her and



holds her captive on top of a building that's under construction. Mario (our hero) sets himself to the task of rescuing his sweetie. As Mario starts to scale the building, the big monkey goes ape and starts chucking barrels at him.

Mario has to climb up ladders, jump over careening barrels and duck flying firefoxes. Ah, but love's labor is lost. It seems that each time Mario gets to the top and a rescue is imminent, Donkey Kong snatches her away again.

Mario, though, is a semi-superman with three lives before he's really dead. But will three be enough? Hardly.

In successive levels he'll have to jump onto a series of fast-moving elevators, avoid some wildly-bouncing springs, duck the firefoxes, dance on a conveyer belt while avoiding contact with the sand buckets on it and watch the clock!

Along the way, Mario will have to leap over all eight steel rivets to score points. If he can accumulate 7000 points, he gets an extra life...he'll need it!

This is quite a good copy of the arcade original by Nintendo. Of course, it's not as lavish as the coin-op, but the graphics and sound are good.

Play-action is very similar to the arcade version, and it's a good addition to the gaming library for the whole family, particularly since it's for one or two players!

Strategy Tip

The barrels and other obstacles don't randomly drop. Get to know the patterns, and coordinate Mario's movements to fit the patterns. For example, jump the first barrel, then take the stairs to avoid the second. Stay on the stairs until the third one passes overhead, then jump the fourth, and so on.

It's not as hard as it sounds, although I doubt anyone's ever mastered all four levels on a consistent basis.

Squish 'Em

(C-64 disk and VIC-20 tape from Sirius Software, 10364 Rockingham Drive, Sacramento, CA 95827. $34.95 disk, $19.95 tape.)

Squish 'Em is a great game to vent your frustrations. I love to climb up the girders and stomp on these creepy-crawlie creatures with my steel-toed work shoes! It's a riot!

Play-action is lively and fun-packed. Your joystick enables you to maneuver your ironworker up and around the girders, while your fire button allows you to raise his legs and squish the crawlies. The color, sound and graphics are outstanding.

At the top of the 48-story building is a suitcase full of cash, and you must scale the girders to collect it. But it's not all that simple.

During your ascent you'll encounter falling bricks, tools and other debris. You'll also have the creepy-crawlies to worry about; if they touch you, you'll fall off the girder and smash into the pavement below—ouch!

You can either try to avoid the creepy-crawlies or squish them under your boot heels. I find squishing to be the most satisfying way to play the game, because you also accumulate points for each crawlie that you squish.

You'll also encounter one bonus prize per level, but you have to claim it on the way up, since you can't return to a lower girder.

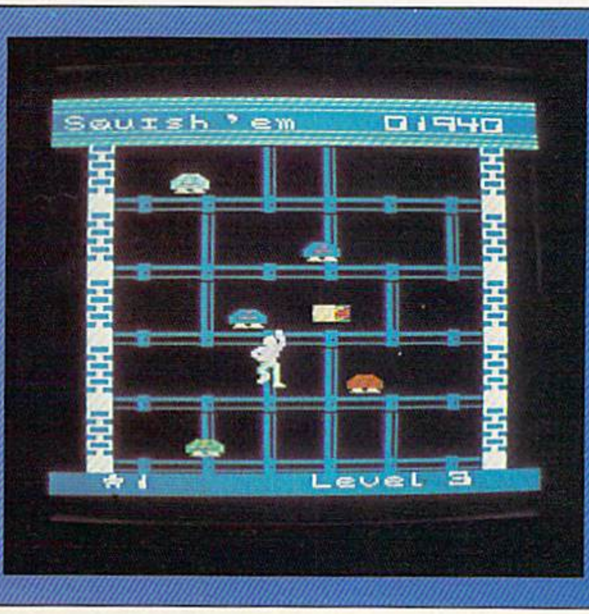
The game is a load of fun and has a high continued-interest level. Your entire family will enjoy Squish 'Em; it's a great game to watch even if it's not your turn to play. You'll have a stompin' good time, no kidding!

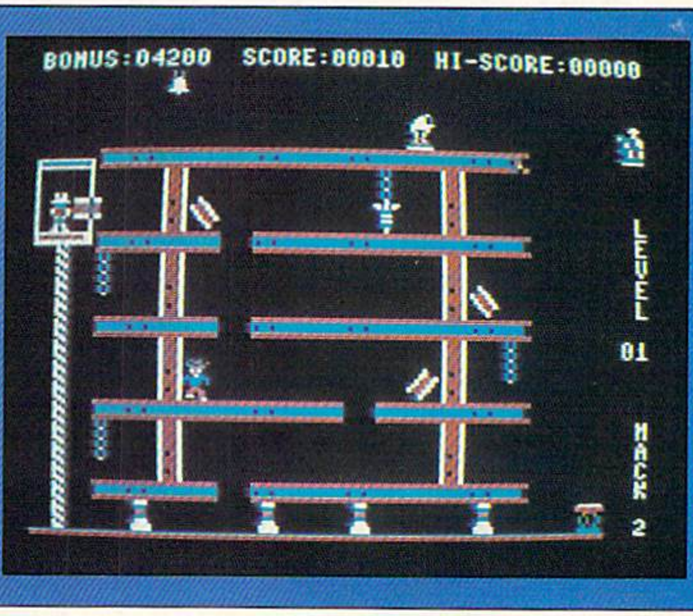
Strategy Tip

Squishing everything in your path and picking up the bonus prizes on each level will gain you the most points. Plan what you're going to squish next, though, because when you first stomp the crawlies, they stay squished for only a few seconds. If they pop back up and turn white, they become invincible and almost impossible to jump. You don't want to be trapped on a corner girder with an indestructible crawlie heading for you!

Hard Hat Mack

(C-64 Disk from Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403. $35.00.)



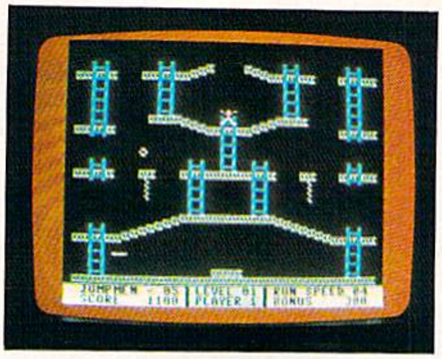


I always have fun with games from Electronic Arts, even before I play them. Their packaging is in the style of an LP record album, and there's always some amusing information printed on the jacket, sort of like the liner notes on an LP. You'll enjoy reading about the creation of Hard Hat Mack from Mike Abbot and Matt Alexander, the game's programmers and designers. It makes for good reading while the game disk boots up.

The game looks simple enough when the first playscreen comes on. Oh, but looks are deceiving! You use a joystick to make little Mack work. He must pick up the girders on each floor and place them in the openings, then grab the rivet gun and fasten them in. He should also claim the bonus prize at the top of the girder structure, if possible.

All the while, little Mack must avoid the Officer of the State Housing Authority (OSHA). Mack soon finds out that Excedrin headache #83 is just another way of saying OSHA.

Points are awarded for picking up girders, ringing the bell, placing a girder, picking up a tool box or steel block, dropping a block into the rivet machine, riveting a girder and picking up a bonus item.



You're initially given three Macks; you win a bonus Mack if you gain 7000 points. The bonus clock starts with 5000 points and counts down, so if you're to achieve a high score, you have to hustle and pick up as many points as possible in the least amount of time.

Everything about Hard Hat Mack is great—graphics, sound effects, color, play-action, interest and challenge levels. This game should retain its popularity for many years.

Strategy Tip

OSHA is really a pain and should be avoided at all costs, since there's no way of defeating him. Watch his running patterns and try to coordinate your girder placement and riveting so that there's as much distance as possible between you and him. Don't hesitate to use the elevator and springboard to avoid this evil little creep—he's out to get you!

Gamesters Alert

I'm in the process of compiling material on joysticks for a future column, and I'm interested in hearing what your favorite joystick is, or which ones you favor for what games. Please drop me a line, including your name, address, age, computer (VIC or 64) and your favorite stick—why you like it and for which games in particular.

Let's see if we can get enough responses to discover the most popular sticks among gamesters. R

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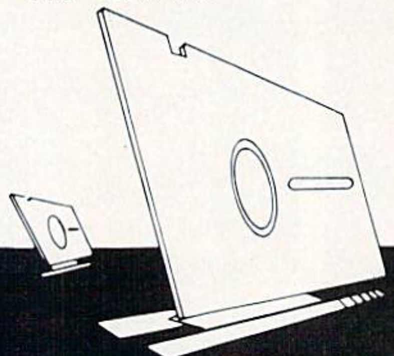

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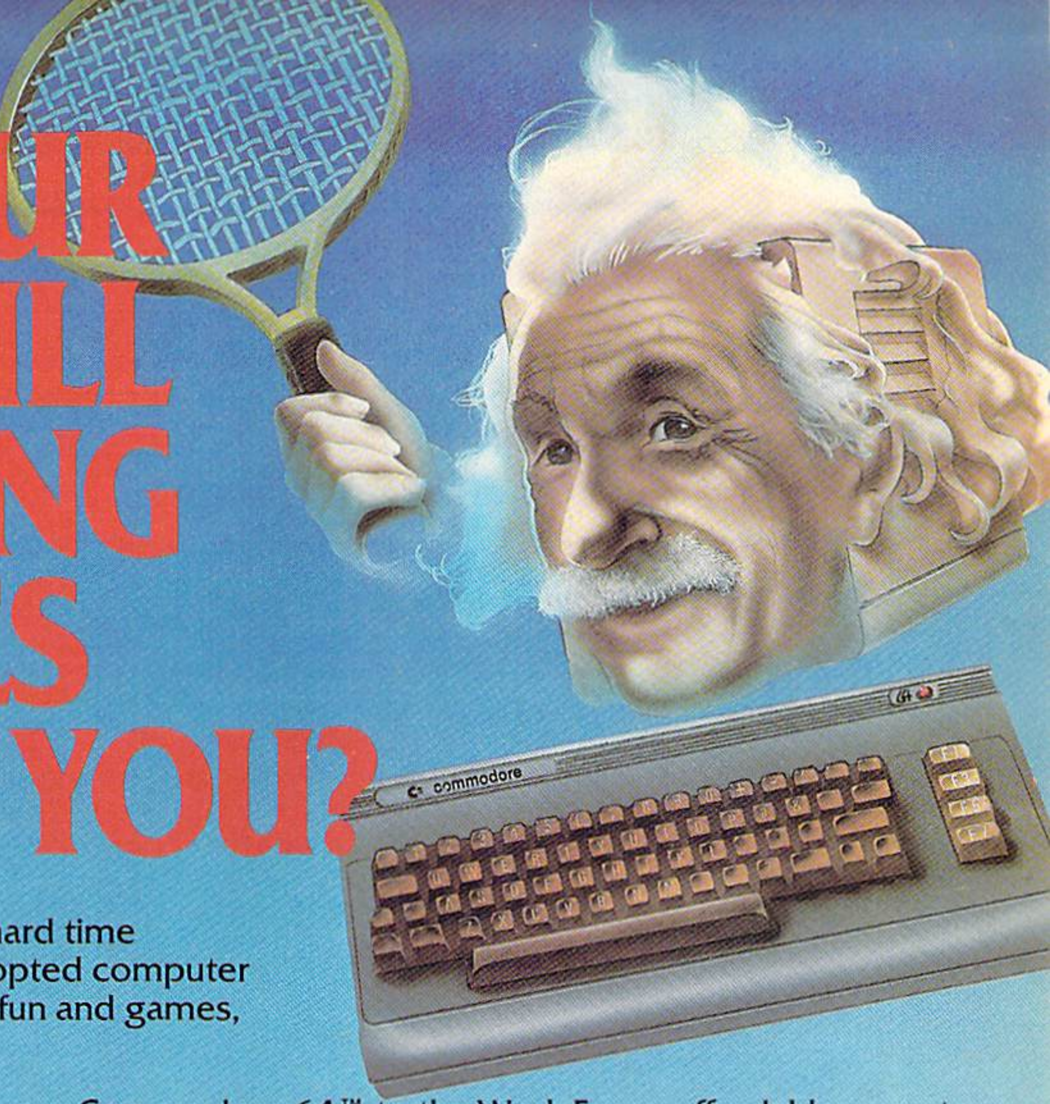

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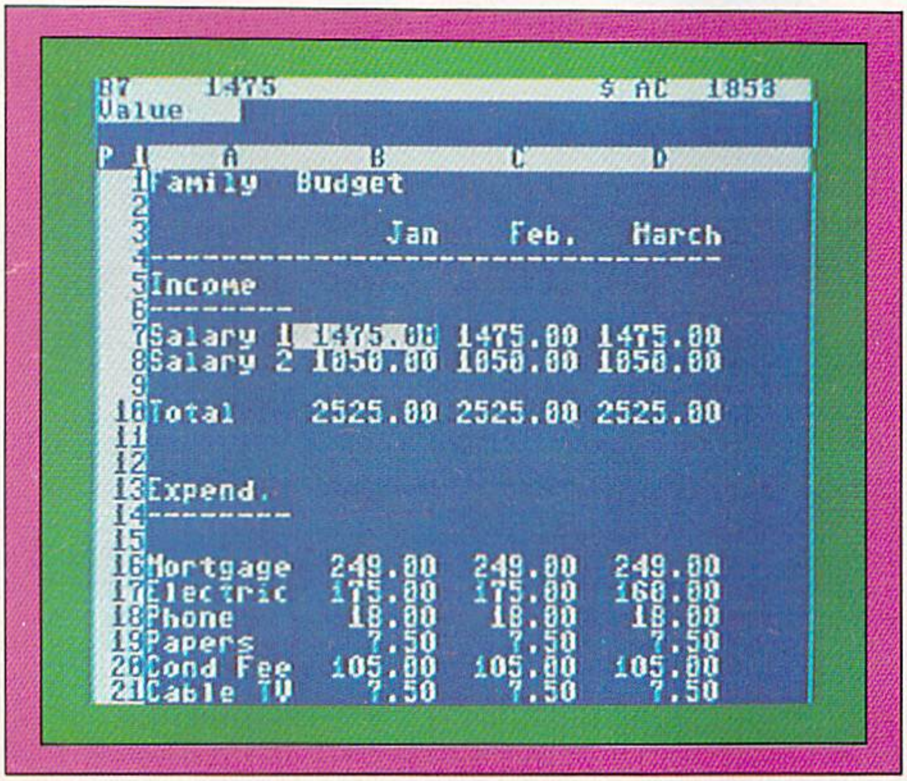
64 AND COMMODORE 64 ARE REGISTERED TRADE MARKS OF COMMODORE BUSINESS MACHINES

Software Gallery

Compiled by Shawn Laflamme



```
B7     1475                          $ AC   1858
Value

P 1     A          B         C         D
 1Family   Budget
 2
 3                Jan      Feb.    March
 4-----------------------------------------
 5Income
 6---------
 7Salary 1 1475.00  1475.00  1475.00
 8Salary 2 1050.00  1050.00  1050.00
 9
10Total    2525.00  2525.00  2525.00
11
12
13Expend.
14---------
15
16Mortgage  249.00   249.00   249.00
17Electric  175.00   175.00   160.00
18Phone      18.00    18.00    18.00
19Papers      7.50     7.50     7.50
20Cond Fee  105.00   105.00   105.00
21Cable TV    7.50     7.50     7.50
```

Report Card

A—Superb!
An exceptional program that outshines all others.

B—Very Good.
One of the better programs available in its category. A worthy addition to your software library.

C—Good.
Lives up to its billing. No hassles, headaches or disappointments here.

D—Mediocre.
There are some problems with this program. There are better on the market.

E—Poor.
Substandard, with many problems. Should be deep-sixed!

Calc Result

If You Need a Sophisticated Spreadsheet, Here's One Well Worth Considering

A

Would you consider a Commodore 64 system (that's complete with processor, disk drive, software and display) for business planning? If the software in question were an easy-to-use spreadsheet program containing the most wanted features, perhaps the answer would be yes.

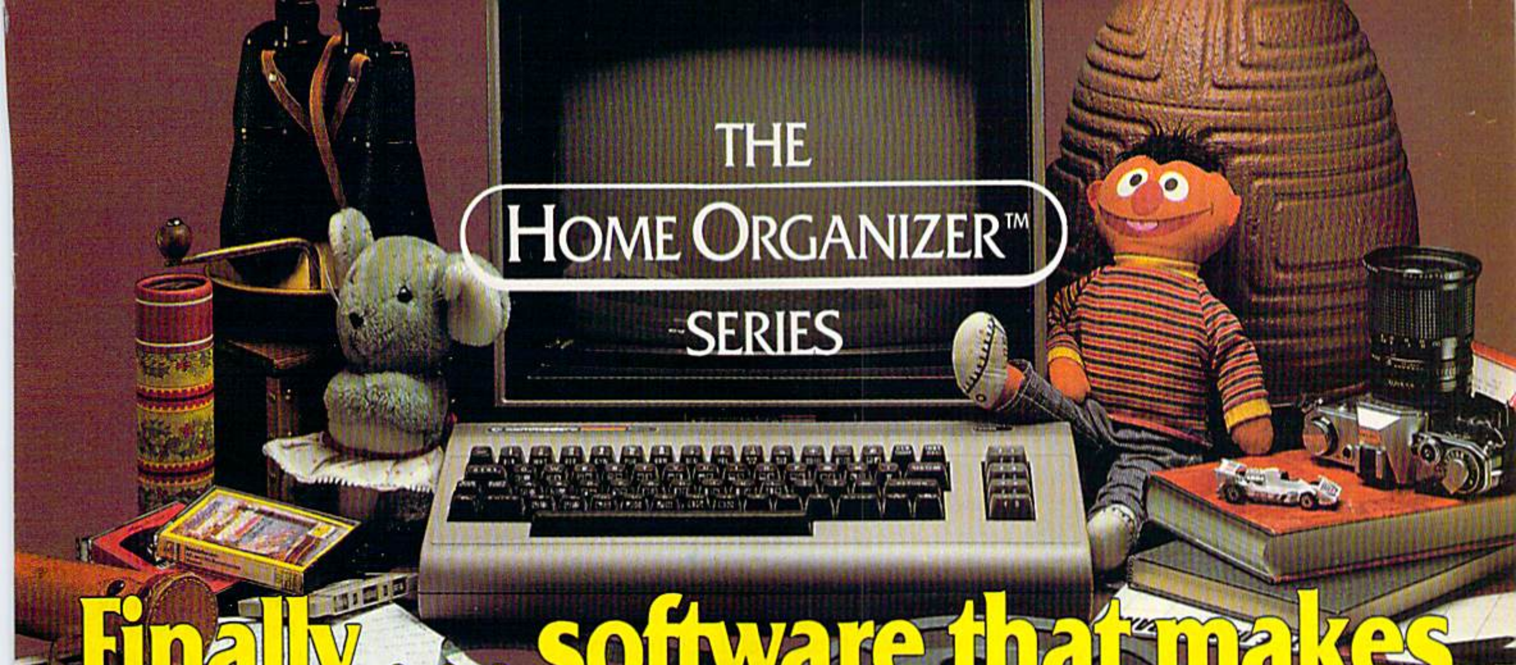
Calc Result (Handic Software, Inc., 5090 Central Highway, Suite 7, Pennsauken, NJ 08110. $149.95) is, I believe, just such a product. It has some very impressive features, suitable for sophisticated business applications. The program's features include integrated color graphics, help displays in any of nine languages, on-line Help function, and the ability to consolidate information from up to 32 worksheets into one report.

Calc Result can also load and save data in the Data Interchange Format (DIF). This means that Calc Result data can be used by programs such as VisiCalc that might be running on other computers in your office, or conversely, information created by different applications can be integrated into Calc Result.

Calc Result requires a Commodore 64, 1541 disk drive (or compatible disk unit attached through an IEEE-488 interface card), display, and optional printer.

What Calc Result lacks in very sophisticated features, covered later, it makes up for in simple operation. Part of the program is contained on a plug-in cartridge placed into the game/cartridge slot. Calc Result then automatically loads the remaining program elements from disk into the computer's main memory (RAM).

When started for the first time, Calc Result will ask you to select the language desired, screen colors and printer specifications. It will then take you through the process of making a backup of the system disk in case the master should become damaged. This copy then becomes the working program disk, though any number of working copies can be made from the master. Any of the specifications, such as color, can be changed during operation with a single command.



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COMMODORE 64 IS A REGISTERED TRADE MARK OF COMMODORE BUSINESS MACHINES

Calc Result contains the most used functions and features needed to easily construct and edit a complex worksheet.

How Calc Result Displays & Handles Data

Just about every spreadsheet uses a row/column format to create, on the computer's screen, a representation of a typical ledger sheet, or worksheet. This sheet extends beyond the bounds of the display both horizontally and vertically; the intersection of the rows and columns creates thousands of "cells" where values, formulas or descriptive labels are entered.

Calc Result uses the same form and then extends it one step further, in effect creating a three-dimensional work area. This is done through the concept of pages. Each Calc Result page is a worksheet composed of 63 columns by 254 rows. Up to 32 of these pages can be created and then consolidated in various ways.

Two pages are held in memory at once. You can switch between them by pressing the F1 function key. The display can also be split in several ways, allowing segments of both pages to be viewed simultaneously.

There are limits to how much information can be entered into a page or split between pages. Fifteen-hundred occupied cells will exhaust available memory; that's about one full page, assuming every location is filled. But even with this restriction, Calc Result's page size and capacity is at par with other products, such as VisiCalc.

Using Calc Result

The display is divided into numbered rows and lettered columns. Above the horizontal axis are three lines that make up a status area. This space is used for displaying command choices, cell contents, cursor position and other relevant information.

The cursor, or location indicator, is a reversed bar. It is positioned at any location on the page using the cursor direction keys. Values are entered into the indicated cell by simply typing the desired figure. Labels, or headings, are specified by first hitting the space bar, then entering the desired text.

The four function keys are used in conjunction with single-lettered commands to control all Calc Result operations. For example, pressing F7 displays the system (main) command list (B, D, E, F, G, L, O, P, Q, R) in the status area, plus a description of what each function key does. F5 is always assigned to the Help function. Help displays include a short explanation of each currently available command and function.

After typing one of the lettered commands from the main group, another list will be displayed. Each grouping of these more specific commands is logically organized into functional areas.

If you've worked with spreadsheets, becoming accustomed to Calc Result should be easy because it operates essentially the same as many other spreadsheets. To the experienced user, the only unfamiliar commands might be Page, which controls bringing pages into memory and manipulating them, and Graphic, for turning values into a histogram display.

Calc Result employs prompts to guide you through many operations. While there are few error messages, it is fairly easy to find where you went wrong in entering a formula or erroneous command.

The documentation is good. The over 100 pages of text contain many color screen photographs and examples. In only a few areas did I find myself searching for more detail and experimenting to figure out how Calc Result would handle the situation in question. Experienced spreadsheet users will have no trouble using Calc Result from the start; however, novices might want to consult some general texts on spreadsheet concepts to supplement the documentation.

Designing a Worksheet

Calc Result contains the most used functions and features needed to easily construct and edit a complex worksheet. The only features not included are those found only in more expensive spreadsheets, such as protected fields and the ability to alter individual column width.

Also, with Calc Result you cannot combine portions of other sheets into the displayed page. However, the page function is used to automatically consolidate similar areas of different pages.

Editing commands allow you to copy or move blocks of information anywhere on the page by simply indicating the upper left- and lower right-hand limits of the block and the new location. Calc Result also contains commands to insert and delete rows and columns, replicate values and formulas, plus one of the easiest line editors I've encountered.

Calc Result takes advantage of the Commodore Screen Editor, allowing the insert and delete keys to be used in modifying the contents of any cell. Just move the cursor to the desired cell, type F7 to get into the edit mode and use the normal editing keys to change the cell contents.

The format command sets left and right justification, type of display (dollar, integer, etc.) and a unique format, color. With this you can display the contents of a cell in any of the 16 text colors available with the Commodore 64. This can be used to set off totals from the rest of the sheet or highlight other important areas.

Since the Graph function displays each corresponding bar in the same color as set in the cell, you control the graph colors through the color format command. For instance, if cell A1 were set to red color format, and you converted it to a graph, the bar representing the value in A1 would also be red. Color format is a powerful command, something seldom found even in those spreadsheets that support a color display.

But the true test of any spreadsheet is the ease of formula construction and the range of functions included. Calc Result scores high in both areas. Normal functions like SUM, MINimum, MAXimum, Standard Deviation, and a complete set of Trig calculations are provided. To sum a column of figures in locations C3 through C20 you would place SUM(C3:C20) in the cell where the sum should be displayed, and so on.

Another area where Calc Result excels is logical operators. These functions are often included in spreadsheets, but they don't always yield the expected results. That is not the case here. Consider the case if the value in B5 is larger than the contents of F10; then place the value "1" in A3 or else the value in B5 will be placed in position A3. This is easily

described by typing this formula in position A3:
IF(B5>F10)THEN(1)ELSE(B5)

Graphics and Windows

The Graphic and Window features are also worth mentioning in some detail as they go beyond the norm. A histogram is produced by placing the cursor in the desired row or column, selecting the Edit command, and then G (Graphic). You are then asked whether to plot the row or column, and prompted to enter the upper and lower range for the vertical scale. The values in the specified row or column are then plotted as a vertical bar graph.

But the most impressive feat is the ability to scroll back and forth through the bars, just as you would move the cursor on the page. The bars scroll instantly across the screen, without requiring any time for redrawing.

The Calc Result screen may be split horizontally or vertically, with both halves scrolling together, or independently—an ideal way to compare different parts of the same page or portions of two different pages.

Up to four windows may be set, each viewing parts of the same page or different pages. While you can't move the cursor out of the last window created, the effect of changing a value in the working window will still be reflected in all the other windows. Split screens are still allowed in the working window. Just be aware of the 40-character wide display since, with four windows, each might only be able to contain a few rows or columns.

Printing exactly what's displayed on the screen is just a matter of pressing the F7 then F6 function keys. Either graphics or the actual page will be reproduced on a Commodore 1515 or 1525 graphic printer. For printing larger portions of the spreadsheet, a specific print command is used. This "formatted printout" also has a provision for changing the column width to any size between 1 and 255 characters, an important consideration when cells may contain large amounts of text.

A Parting Look

The Commodore 64 has the potential for handling sophisticated business applications. Calc Result proves that.

Constructing sheets and evaluating models with Calc Result is as straightforward as with any other spreadsheet I've used. There is only a slight delay caused by recalculation when a value is revised. This is more noticeable as the page becomes filled.

Otherwise, Calc Result is the most complete spreadsheet currently available for the Commodore 64. If you need a sophisticated spreadsheet, this one is worthy of serious consideration.

Michael Heck
Harleysville, PA

Final Orbit/ Bumper Bash

Space Adventure And Pinball Action— All on One Cartridge!

Sirius Software has produced a unique game package for the VIC-20, with one software cartridge containing two games. Slide the cartridge into your computer, fire it up, and you're ushered into the game of Final Orbit; press the Commodore logo key on your VIC-20, and instantly the game switches over to Bumper Bash.

This isn't a bad idea at all! If you get tired of one game, it's easy to switch over to the other, and there's no fidgeting with cartridges or long stretches of waiting for the cassette to load something. Let's look at Final Orbit first, and then see what Bumper Bash has to offer.

In Final Orbit, you're defending the Earth against an onslaught of Maladroid fighters and satellites. These space vehicles are capable of firing bright missiles, and each hit that you sustain weakens either your own, or Earth's, energy levels. You must fight back and destroy the Maladroid fighters and satellites by blasting the evil characters with your laser gun. Adding to the challenge is that your only defense against the Maladroid laser rays is retreat; you must dart in and destroy some ships, then beat it before one of their own blasts comes your way.

The view before you is from the front window of your spacecraft. A dark region of space is peppered by stars in the background. The various Maladroid forces leap into view. Since your ship is in orbit around the planet Earth, you may see its surface at the very bottom of your screen. As you advance forward, its various features whiz by you; when you retreat, they shoot by in the opposite direction. In sum, your window allows you to see a good portion of outer space in front with features of our globe sliding by at the very bottom.

Although you can see a substantial amount of space from your front win-

> Your screen comes alive with motion and color. This is as close to true arcade action as the VIC-20 will ever come!

dow, there still exist portions that are out of range and may be harboring Maladroid forces. To aid you, a radar is available at the top of your video screen. A good pilot will glance back and forth from the radar view to the actual view, thus defending himself against surprise attacks.

The energy level of both the Earth and your spacecraft is monitored at the bottom of the screen by the Game Status Bar. When this indicator is green, everything is OK, but if it turns yellow, your own destroyer's energy level is dropping. If it turns red, the Earth's energy level is critical. To restore the flagging energy levels, you must find and follow a Maladroid fighter that is returning to its mothership. As soon as the mothership is visible, blast it, and your energy reserves are brought back up again. Fighters that are returning to their motherships show up on the screen with a white bar across their tails. By the way, following a fighter to its mothership is no easy feat; it doesn't always take the straightest path home!

In terms of graphics and sound, this game wins any competition hands down. All of the perspectives and 3-D graphics are handled very well and with very high resolution. For example, the picture of the Earth's surface rushing by is exquisite; likewise, Maladroid fighters making a hasty retreat to their mothership is outstanding. The radar screen, laser blaster arms, crosshairs and all of the other niceties add up to create a very realistic image of outer space. Your VIC-20 monitor screen truly comes alive with much simultaneous motion and color—a real treat for sci-fi enthusiasts. In my opinion, this is as close to true arcade action as the VIC-20 will ever come!

The sound is manipulated quite well too, with a multitude of effects carrying on simultaneously. Warning sirens, laser blasts, explosions and general spaceship noises create quite a cacophony!

So, I give this game an excellent rating when it comes to graphics, animation and sound. Unfortunately, I can't be so generous when it comes to strategy and game play. The concept is dreary; blast the aliens before they blast you. How many games of this nature are we willing to endure? And worst of all, unlike some games that reward you with extra men, new rooms to conquer or other secret treasure, your only booty in this game is points. It's true that the graphics displaying your score are quite fabulous, but still, they're only points!

It may well be that younger VIC-20 users will find Final Orbit a treat, since they may not be all that interested in strategy, rewards or tricky game play. I suspect that youngsters will be intrigued by the animation, but old pros will grow weary of the "shoot-em-up" nature of the game.

Bumper Bash, the other game available on this cartridge, has the same good and bad points. As the name implies, this is a pinball game and the graphics are stupendous. The ball bounces around the various bumpers, flippers and paddles in a delightful way. As it takes on English and changes speed, you could swear you were looking at the real thing! But perhaps most astounding is the multitude of sounds this game generates. Bumper Bash really pushes the VIC-20 to its synthesizing limits!

Unfortunately, this game suffers from the same problems as Final Orbit. Although the animation is a cut above any other game on the market, the game play is sufficiently routine to lead to boredom. Again, the only reward is points, and there are no surprises to spice up the action. Hardcore pinball players may see something here that I don't, but after a day's worth of games, I decided I had played enough pinball for one lifetime. But if a friend ever asks me if a computer can simulate real-life phenomena, I'll be sure to pull this cartridge out and show him the most realistic application of the laws of physics I've ever seen. If that same friends asks to play a game, though, I'll put it away and pull out something more satisfying!

Since this cartridge contains two games, it's only fair to rate the entire package all at once. Each game has exciting graphics, sound and animation and each is rather dull after one night of play. But the mere fact that the cartridge contains two games raises the final rating somewhat; if you get tired of one you can switch to the other. In general, this should be enough to make the cartridge suitable for younger gamesters, but not quite enough to satisfy old pros. *(Sirius Software, Inc., 10364 Rockingham Drive, Sacramento, CA 95827. $39.95.)*

Thomas Henry
Mankato, MN

Insta-Writer

The First-Time User Will Become an "Insta" Beeper With This C-64 Word Processor

This review of the Insta-Writer word processor for the C-64 is based on the cartridge version of Insta-Writer.

The instruction manual is well printed, and includes a "tutorial," or step-by-step example, to get you going. As you follow the instructions in this tutorial, don't worry about any confusing references; they are explained more completely later.

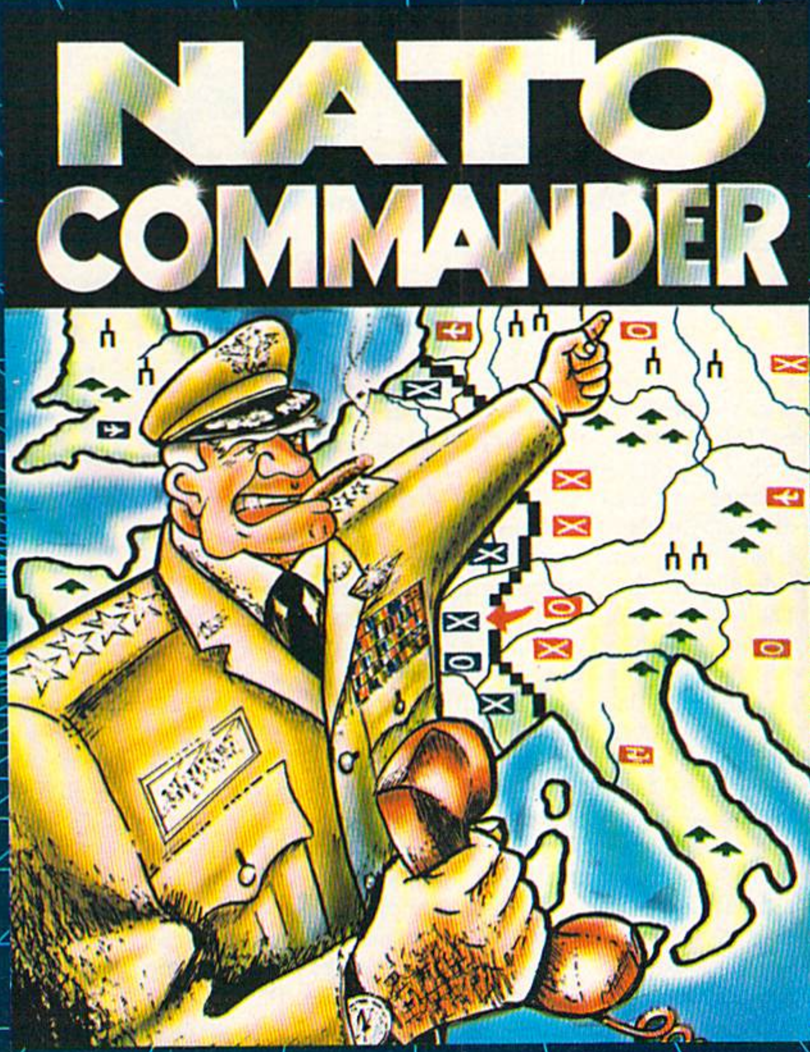
Picking Nits

Now, at the risk of being accused of nit-picking, I must mention something which so confused me I had to call the manufacturer to clear it up. The tutorial frequently refers to the Quick Reference Cards. I searched everywhere for these reference cards. Don't think they've been left out of your package, because there simply aren't any.

Page 13 of the manual is titled Insta-Writer Quick Reference Cards. I suspect that once-upon-a-time there actually were some cards for quick reference, but they were incorporated into the manual. (Now, for only $10 more, you can send for a disk or cassette with a Help screen, which will provide quick reference for the commands explained in the manual—information that should have been included in the program initially.)

A final note about the instructions. The index in the manual is inadequate. The user would have been better served if the designer had used the two lined

Is It a Game — Or Is It Real?



Nato Commander is available for Atari and Commodore 64 computers, 48K disk or cassette. IBM-PC version will be available shortly.

Suggested retail price for this outstanding real-time combat simulation is $34.95.

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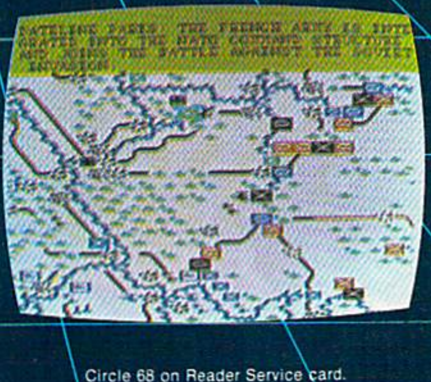

DATELINE PARIS. THE FRENCH ARMY IS INTEGRATED INTO THE NATO COMMAND STRUCTURE AND JOINS THE BATTLE AGAINST THE SOVIET INVASION.

Circle 68 on Reader Service card.

MicroProse Software

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pages in the back for a more complete listing of commands.

Features

The program itself is quite simple to learn and to operate. Unfortunately, part of its simplicity is due to the extreme limitations of its range of functions. You can reset the margins and tabs easily, center your lines and, given the proper interface, underline words.

Unfortunately, you can't make many more adjustments. The page length is pre-set for 62 lines with a self-serving explanation about how American this length is, and how "62 lines work great."

Well, if you print a page that is only 51 lines long, or double-space, which leaves you only 25 lines per page, your printer will reach the end of the text and advance the paper up and out like some mad machine from a silent movie comedy. I fear that the rigid page length of Insta-Writer is a major mistake in program design.

A word about the word wrap. The line length is pre-set to 75 characters, which restricts the word wrapping feature to every other line (apparently a common fault in word processing programs for Commodore 64s.

To set the screen so the word wrap works on every line, reset the margins to 38 characters, type in your text, do your editing, then go back to the top and reset the margins to the length you want the printed lines to be. It's a little awkward, but it works. It doesn't, however, help the hyphenation problems caused by this system.

You may not believe this, but my second printer, which prints only 24 columns across, works fine with the Insta-Writer. I don't know why anyone would want a document only 24 columns wide—that's the width of the adding machine paper my printer uses—but for any of you out there who do, it's possible.

The Insta-Writer program is line- or screen-oriented (rather than word), which means that you have to think in terms of lines per screen, and pages of text. Given the average page length (forget their 62 lines per page) and average number of words per page (about 500), this limits the text to about 2000 words before it all has to be printed or saved on disk or cassette.

I found annoying the fact that you have to watch where you are on every page. If you get carried away and type too many lines, it takes all kinds of juggling to get the extra text moved to another page, especially if you have filled up the other three pages before making the mistake. For a writer, this becomes a serious interruption to the creative flow.

Evaluation

Insta-Writer is not a bad word processing program, but for about $50, it does what you might expect from a program costing half that much. You don't have access to the ASCII code, which means you cannot send specific instructions to your printer, as is possible with more sophisticated processor programs. For instance, I cannot underline anything using my electric typewriter and Insta-Writer (or even my crazy little two-inch dot-matrix printer).

When I opened the review package, I guess I was hoping for something special. I didn't get it.

I get the feeling that some programmers still think the Commodore 64 is a toy, and that the user will not ask the word processing program to do much of anything except print simple documents. These programmers are wrong, and I suggest that any potential buyer of a word processor check carefully to see exactly how sophisticated the program really is. *(Cimarron Corp., 2185 South Hathaway St., Santa Ana, CA 92705. $51.95.)*

G. Scott Wright
Albany, NY

ORY CASIN
DKR

Victory Casino

The VIC-20 Gambler Tests His Luck In These Games of Chance

B

Gamblers who beat the odds win no fortunes in Victory Casino. No chips. No gold. Not even paper money.

However, if you were born with a gambler's heart, you will find plenty of action on this VIC-20 cassette.

In the casino's high-tension palace, Lady Luck exists in the guise of the VIC-20 computer. Her kingdom resides in three games of chance: even-odd, dice, and high numbers. You receive one thousand dollars at the start of each game.

In even-odd, you perform an easy guessing game with your computer. Your artificial thinker must predict whether or not odd or even ("o" and "e," respectively, on the keyboard) is chosen, during the course of five minutes of play. Letters appear, one at a time, in three vertical columns on the screen, in response to your typed-in choices. If the program guesses your selections over 50% of the time, you lose one hundred dollars. If it doesn't, you win one hundred dollars. An asterisk materializes next to each correct guess, each time one is made.

For dice freaks, it costs twenty-five dollars of your total dough to begin a game of dice. Your challenge is to decide whether or not to keep rolling dice. If a roll matches the first roll, you lose money. If you stop ahead of the game, you win money. The more successful (non-matching) rolls you dare, the more you will win. You must press y (yes) or n (no) on the keyboard, in order to continue rolling or to stop. If you stop immediately at the end of one or two rolls, your money's lost. Actual scenes depicting dice throws do not appear on the screen. Outcomes of imaginary tosses are printed in front of you.

> *The computer seems to outwit you too often. Is it. . . cheating?*

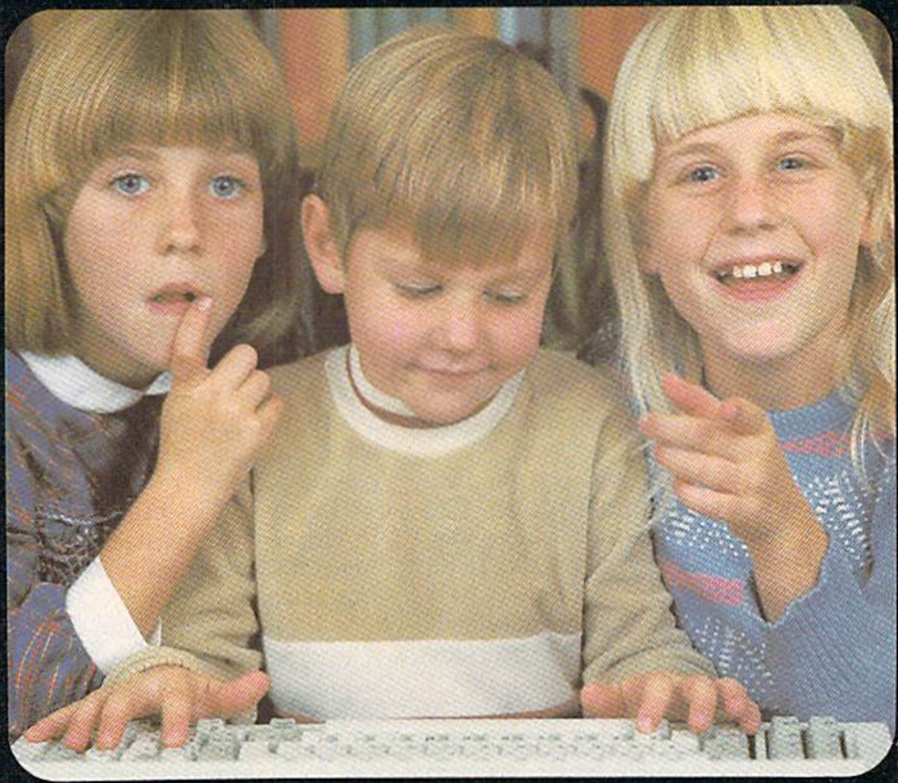
In the game of high numbers, the program randomly selects ten numbers, each one between 100 and 999, and lists them separately. Your goal is to pick the highest one of them all. When each number is printed, you do one of three things: 1) double your bet (your initial bet is one dollar); 2) skip to the next number; or 3) place a bet on that particular number, as the highest one. When a wrong, or winning, number is chosen, all numbers are immediately listed (with an arrow printed beside the highest number). Correct choices earn the total amount of money risked. Naturally, wrong guesses lose the money placed.

If you like games of luck, Victory Casino is for you. No graphics, per se, exist; each game consists of printed letters and numbers on the screen. Initial directions for each one are clear and easy-to-follow. The computer constantly keeps you informed of the amount of money won or lost.

In even-odd, the computer seems to outwit you—too often! Is it... cheating? Either that, or your computer actually calculates your guesses, in an overall pattern, based on prior moves. If you keep pressing "e," for instance, it will start guessing "e" most of the time. If you make guesses in rapid succession, a form of "cheating" occurs—the computer always wins. Avoid this snag by pausing each time.

All three games offer a gambler's high. No real money is at stake. Just fun. *(Victory Software Corp., 7 Valley Brook Road, Paoli, PA 19301. $19.95.)*

John DiPrete
Cranston, RI



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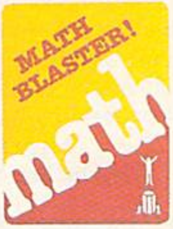

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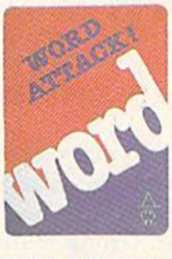

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The Mail RUN

Word Processing[1]

In your article, "C-64 Word Processing Demystified!" (*RUN*, January 1984), five of the word processors indicate in the chart on pp. 74–75 that they do footnotes, and one claims not to do them automatically.

Of the five that claim to do footnotes, I have used four of them. The only one that does true floating footnotes automatically is TOTL.TEXT 2.6. It's possible to do footnotes with almost any word processor, but only if the user places them in the correct location.

I've also found there's a good deal of confusion about what is a footnote and what is a footer. Many people incorrectly think they are the same thing.

Larry Woolard
Lincoln, IL

[1] *Thanks for sharing your discovery with us. To eliminate any further confusion among our readers,* Webster's Ninth New Collegiate Dictionary *tells us that a footer is an archaic term for pedestrian.*

Editors

An Early Addition

When I typed Symbol Code (*RUN*, January 1984) as listed, neither the symbols nor the pointer on the right side of the screen displayed; characters, but not color were Poked into the memory. The following additions solve this problem.

```
204 GOSUB 1400
1400 LO=55401
1401 FOR X1=0TO22
1402 FOR X2=0TO13
1404 POKE LO+X2,0
1406 NEXT X2
1408 LO=LO+40
1410 NEXT X1
1412 RETURN
```

Thomas McAlpine
Madison, WI

You probably have an early model of the Commodore, which uses a different background color. For an even shorter version of your helpful correction, enter this one line:

```
204 FOR QW=55296 TO 56319:POKE QW,0:
NEXT QW
```

Editors

Expand on VIC

I wish to compliment your entire staff on an excellent magazine. VIC-20 and C-64 users have been waiting for this type of publication.

I suggest that *RUN* occasionally include programs meant to run on expanded VIC-20s. A high percentage of VIC users have expansion modules up to 8K, and the apparent lack of software for the expanded VIC is somewhat frustrating.

John Branthoover
Oxnard, CA

I have read your premiere issue from cover to cover about two dozen times in the month that I've had it. Your initial effort is everything and more than your promo promised.

I would like to see an article on various expander cards for the VIC-20. It's a hassle to turn off the system every time I want to change a cartridge.

An article on the 40/80 column cards would be helpful since I'd like to get a monitor and expand to the word processor and database areas. I realize there may be better machines for such operations, but I love my VIC-20.

Terry Lampe
Virginia Beach, VA

What's Commitment?

As new Commodore 64 owners, we recently purchased *RUN* from a local store, and, we liked it so much that we sent in a check for a three-year subscription.

We look forward to many more programs like the Canyons of Zelaz, which has amused all of us.

Mr. and Mrs. George Hoffmann
Rochester, NY

For Your Eyes Only

I just happened to pass a local newsstand, and *RUN* caught my eye. I'm glad it did. I just sent in the subscription card.

I enjoy game programs, but I'd most like to see utility and tutorial programs.

Nicholas Castoria
Brooklyn, NY

For the Birds

I want to use my C-64 for my hobbies of family genealogy and birding. Are any of you *RUN* readers birders, who have put your bird lists on your computers (e.g., life list, yearly list, state lists, etc.)?

Also, do any of you know of lists containing world or North American birds that have been uniquely numbered, which might then serve as ID numbers for a record? I'd like to hear from other birders.

Marscha Chenoweth
655 W. Irving Park 2716
Chicago, IL 60613

Ups and Downs

I would prefer listings to be printed vertically on a page; it's much easier to type the programs from the magazine.

John Aloi
Ridgway, PA

It is not RUN*'s policy to publish listings horizontally, but occasionally, due to space limitations, we must.*

Editors

A Monthly Affair

I own a VIC-20 and have a subscription to *RUN*—I love it and am sure it will be most popular with Commodore owners all over.

Please keep up the great work, because I really look forward to receiving *RUN* each month.

Bill Moffatt
Bartow, FL

A Godsend

Why haven't you adopted the method of using a checksum proofreader? They are a godsend to copyists and make the successful running of a program nearly foolproof.

Dan E. Yoder
St. Petersburg, FL

We're in the process of developing such a system, which we plan to implement within the next few months.

Editors

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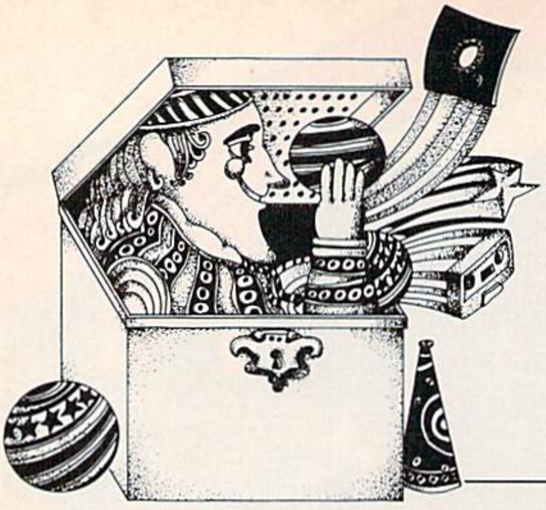


Video Casino

By David Busch

Unlike craps, you lose *when you roll your point in this nerve-wracking game that makes use of random numbers. For the VIC-20 and C-64.*

This month, by putting together a little game that is the *opposite* of craps (that is, you try to *avoid* rolling your point), we'll discover how the VIC-20 and Commodore 64 choose random numbers.

In Nerves, you and your opponent try to amass 500 points. At each turn, you roll a point, and then continue to roll as many times as you dare. The number of each roll is added to a jackpot. If, however, you roll your initial point again, the amount of points in the jackpot is *subtracted* from your score!

You may continue to roll, or stop at any point and collect the jackpot. Stopping too soon (because of lack of nerve) means that a swollen jackpot isn't harvested.

The action can get *very* nerve-wracking. You have 400 points, your opponent, 480. The jackpot is 90 points. Should you roll again, and possibly get enough points to go over 500 and win? Or should you collect the 90 points and hope your opponent does not collect 20 on the next turn? One bad roll will mean that 90 points are subtracted, leaving you with 310, and an almost sure loss. You get the idea.

Nerves is an easy game to learn, because the odds are very similar to those in craps. Rolling a 12 or 2 as a point is a freeway to a large jackpot. Odds are that you can amass 100 or 200 points (maybe more) before your initial number turns up again. As points approach the middle numbers, more caution is advised. The game is especially exciting, because there is really no reason why a 12 can't be rolled three times in a row. It happens; it's just against the odds.

Operation of the program is simple. A "roll dice" routine is accessed as needed. The first roll is stored in variable FR, and any time a subsequent roll equals FR, the program branches to the "you lose!" routine, and subtracts the jackpot amount, TT, from your cash. These cash values are stored in a two-element array, Cash(1) and Cash(2), with the appropriate subscript determined by whether variable Player equals 1 or 2.

TT is increased by the amount of each roll, until you finally claim the pot, or until your point is rolled, and TT is subtracted from your winnings. When a turn ends, the program checks lines 580–600 to see if Player equals 1 or 2, and sets its value to the opposite. Each turn, a check is made to see if either you or your opponent has more than 500 points. If so, the program branches to a routine that announces the winner.

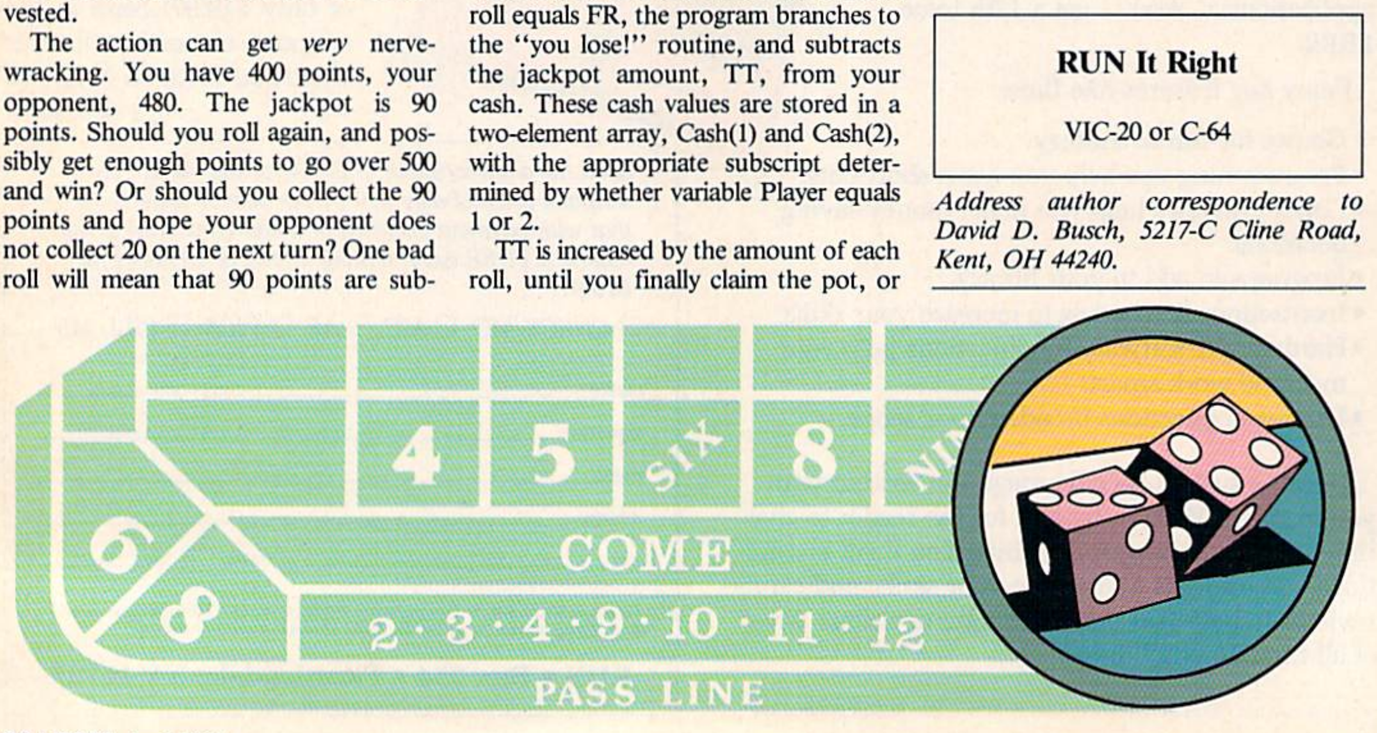
Random Rolls

This program introduces the concept of RND, the choice of a random number by the computer. When the VIC-20 and Commodore 64 encounter the statement RND(1), they will choose a number larger than zero, but smaller

RUN It Right

VIC-20 or C-64

Address author correspondence to David D. Busch, 5217-C Cline Road, Kent, OH 44240.



than one. This might be .562391, .29171, or some other decimal fraction.

However, to simulate dice, we want whole numbers in the range 1–6. To produce these, you multiply by the largest whole number you want and add one. For example, RND(1)*6 will produce real numbers larger than zero but less than 6. Adding one to any of these will give you random numbers between 1-plus and 6-plus. Taking the integer portion of the number gives you whole numbers in the desired 1–6 range.

Are the numbers truly random? Strictly speaking, no, because the computer uses a fixed formula (algorithm, in computer-talk) to arrive at a series of numbers that are called pseudo-random. This series is very long, and the computer generally starts at a different place in the sequence each time, so you rarely find the numbers repeating.

You advanced programmers will want to know that the number that the RND statement works on (the argument) affects the starting point of the sequence. This is called the seed. RND(0) will generate a random number that relates to the VIC-20's and C-64's built-in clock. This clock begins counting, in 1/60th-second intervals, from the time the computer is first powered on.

> *Are the numbers truly random? Strictly speaking, no. But you'll rarely find the numbers repeating.*

If the argument is less than zero (RND(−1), for example), the random number sequence is automatically reseeded. Arguments greater than zero, as in RND(1), will produce the same random number sequence for any given random number seed.

The differences actually have little effect in short programs like this one. Key in the following short program and see what happens.

```
10 INPUT "ENTER ARGUMENT :";X
20 R=RND(X)
30 PRINT R;
40 GET A$:IF A$="" GOTO 40
50 GOTO 20
```

Run it a few times, entering different values for X, and watch the sequences. Press any key to see the next random number. Between runs, hit the run/stop plus restore keys to ensure that the computer is fully reset.

Listing 1. The Nerves program for the VIC-20.

```
10 REM **********
20 REM *        *
30 REM * NERVES *
40 REM *        *
50 REM **********
60 PRINT"{SHFT CLR}{2 CRSR DNs}"
70 PRINT"ENTER NAME OF PLAYER 1"
80 INPUT PLAYER$(1)
90 PRINT"ENTER NAME OF PLAYER 2"
100 INPUT PLAYER$(2)
110 PRINT"{SHFT CLR}{2 CRSR DNs}"
120 PRINTTAB(8)"{CTRL 9}{CTRL 3}NERVES{CTRL 0}{CTRL 7}{
     2 CRSR DNs}"
130 PRINTTAB(2)"TRY TO REACH 500"
140 PRINTTAB(2)"POINTS BEFORE"
150 PRINTTAB(2)"YOUR OPPONENT."
160 PRINTTAB(2)"ROLL DICE UNTIL YOU"
170 PRINTTAB(2)"MAKE POINT AND LOSE"
180 PRINTTAB(2)"OR QUIT AND COLLECT!"
190 PRINT"{CRSR DN}"
200 PRINTTAB(6)"{CTRL 9}{CTRL 6}HIT ANY KEY{CTRL 7}"
210 GET A$:IF A$="" GOTO 210
220 PLAYER=1
230 OP=2
240 CASH(1)=200
250 CASH(2)=200
260 GOTO 290
270 ROLL=INT(RND(1)*6)+INT(RND(1)*6)+2
280 RETURN
290 PRINT"{SHFT CLR}{2 CRSR DNs}"
300 PRINTTAB(2)"{CTRL 9}{CTRL 6}";PLAYER$(PLAYER);"{CTR
     L 7}{CTRL 0} IS UP.{2 CRSR DNs}"
310 GOSUB 270
320 FR=ROLL
330 GOSUB 270
340 IF FR=ROLL GOTO 330
350 GOTO 400
360 PRINT"{SHFT CLR}{2 CRSR DNs}"
370 GOSUB 270
380 PRINTTAB(2)"{CTRL 9}{CTRL 6}";PLAYER$(PLAYER);"{CTR
     L 7}{CTRL 0} IS UP.{2 CRSR DNs}"
390 IF FR=ROLL GOTO 620
400 IF CASH(1)>500 OR CASH(2)>500 GOTO 720
410 PRINTTAB(2)"FIRST ROLL:";FR
420 PRINT"{CRSR DN}"
430 PRINTTAB(2)"NEXT ROLL:";ROLL
440 PRINT"{CRSR DN}"
450 TT=TT+ROLL
460 PRINTTAB(2)"YOUR TOTAL:";CASH(PLAYER)
470 PRINT"{CRSR DN}"
480 PRINTTAB(2)"POT:";TT
490 PRINT"{CRSR DN}"
500 PRINTTAB(2);"OPP. PTS.:";CASH(OP)
510 PRINT"{CRSR DN}"
520 PRINTTAB(6)"{CTRL 9}{CTRL 3}ROLL AGAIN?{CTRL 7}"
530 GET AN$:IF AN$="" GOTO 530
540 IF AN$="N" THEN CASH(PLAYER)=CASH(PLAYER)+TT:GOTO 5
     70
550 IF AN$="Y" THEN FOR N=1 TO 100:NEXT N:GOTO 360
560 GOTO 530
570 TT=0
580 IF PLAYER=1 THENPLAYER=2:OP=1:GOTO 290
590 OP=2
600 PLAYER=1
610 GOTO 290
620 PRINT"{SHFT CLR}{2 CRSR DNs}"
630 PRINTTAB(2)"YOU LOSE!"
640 PRINTTAB(2)"YOU HAVE";
650 CASH(PLAYER)=CASH(PLAYER)-TT
660 PRINT CASH(PLAYER)
670 PRINT"{CRSR DN}";TAB(6)"{CTRL 9}{CTRL 6}HIT ANY KEY
     {CTRL 7}"
```

More

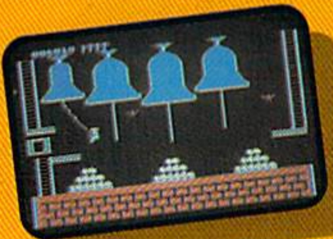
Listing 1 continued.

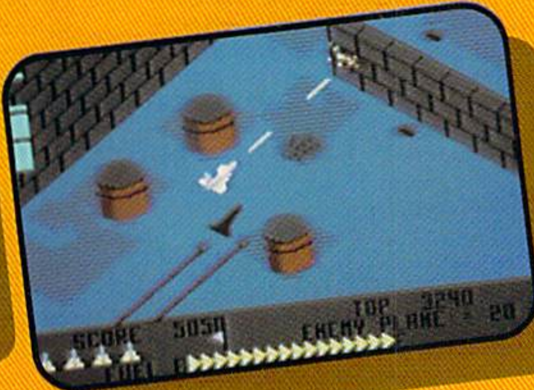
```
680 GET A$:IF A$="" GOTO 680
690 TT=0
700 PRINT"{SHFT CLR}"
710 GOTO 570
720 PRINT"{SHFT CLR}{2 CRSR DNs}"
730 IF CA(1)>CA(2)THEN PRINTTAB(2)PL$(1);" WINS!!":PRIN
     TTAB(2)" WITH";CA(1):GOTO 760
740 PRINTTAB(2)PL$(2);" WINS!!"
750 PRINT" WITH $"CASH(2)
760 PRINT"{2 CRSR DNs}"
770 PRINTTAB(4)"{CTRL 9}{CTRL 6}PLAY AGAIN?{CTRL 7}"
780 GET A$:IF A$="" GOTO 780
790 IF A$="Y" THEN RUN
```

Listing 2. The Nerves program for the C-64.

```
10 REM **********
20 REM *        *
30 REM * NERVES *
40 REM *        *
50 REM **********
60 POKE 53281,1
70 PRINT"{SHFT CLR}{2 CRSR DNs}"
80 PRINTTAB(8)"ENTER NAME OF PLAYER 1"
90 INPUT PLAYER$(1)
100 PRINTTAB(8)"ENTER NAME OF PLAYER 2"
110 INPUT PLAYER$(2)
120 PRINT"{SHFT CLR}{2 CRSR DNs}"
130 PRINTTAB(15)"{CTRL 9}{CTRL 3}NERVES{CTRL 0}{CTRL 7}
     {2 CRSR DNs}"
140 PRINTTAB(8)"TRY TO REACH 500"
150 PRINTTAB(8)"POINTS BEFORE"
160 PRINTTAB(8)"YOUR OPPONENT."
170 PRINTTAB(8)"ROLL DICE UNTIL YOU"
180 PRINTTAB(8)"MAKE POINT AND LOSE"
190 PRINTTAB(8)"OR QUIT AND COLLECT!"
200 PRINT"{CRSR DN}"
210 PRINTTAB(12)"{CTRL 9}{CTRL 6}HIT ANY KEY{CTRL 7}"
220 GET A$:IF A$="" GOTO 220
230 PLAYER=1
240 OP=2
250 CASH(1)=200
260 CASH(2)=200
270 GOTO 300
280 ROLL=INT(RND(1)*6)+INT(RND(1)*6)+2
290 RETURN
300 PRINT"{SHFT CLR}{2 CRSR DNs}"
310 PRINTTAB(9)"{CTRL 9}{CTRL 6}";PLAYER$(PLAYER);"{CTR
     L 7}{CTRL 0} IS UP.{2 CRSR DNs}"
320 GOSUB 280
330 FR=ROLL
340 GOSUB 280
350 IF FR=ROLL GOTO 340
360 GOTO 410
370 PRINT"{SHFT CLR}{2 CRSR DNs}"
380 GOSUB 280
390 PRINTTAB(9)"{CTRL 9}{CTRL 6}";PLAYER$(PLAYER);"{CTR
     L 7}{CTRL 0} IS UP.{2 CRSR DNs}"
400 IF FR=ROLL GOTO 630
410 IF CASH(1)>500 OR CASH(2)>500 GOTO 730
420 PRINTTAB(9)"FIRST ROLL:";FR
430 PRINT"{CRSR DN}"
440 PRINTTAB(9)"NEXT ROLL:";ROLL
450 PRINT"{CRSR DN}"
460 TT=TT+ROLL
470 PRINTTAB(9)"YOUR TOTAL:";CASH(PLAYER)
480 PRINT"{CRSR DN}"
490 PRINTTAB(9)"POT:";TT
500 PRINT"{CRSR DN}"
510 PRINTTAB(9);"OPP. PTS.:";CASH(OP)
520 PRINT"{CRSR DN}"
530 PRINTTAB(12)"{CTRL 9}{CTRL 3}ROLL AGAIN?{CTRL 7}"
540 GET AN$:IF AN$="" GOTO 540
550 IF AN$="N" THEN CASH(PLAYER)=CASH(PLAYER)+TT:GOTO 5
     80
560 IF AN$="Y" THEN FOR N=1 TO 100:NEXT N:GOTO 370
570 GOTO 540
580 TT=0
590 IF PLAYER=1 THEN PLAYER=2:OP=1:GOTO 300
600 OP=2
610 PLAYER=1
620 GOTO 300
630 PRINT"{SHFT CLR}{2 CRSR DNs}"
640 PRINTTAB(9)"YOU LOSE!{2 CRSR DNs}"
650 PRINTTAB(9)"YOU HAVE";
660 CASH(PLAYER)=CASH(PLAYER)-TT
670 PRINT CASH(PLAYER)
680 PRINT"{2 CRSR DNs}";TAB(10)"{CTRL 9}{CTRL 6}HIT ANY
     KEY{CTRL 7}"
690 GET A$:IF A$="" GOTO 690
700 TT=0
710 PRINT"{SHFT CLR}"
720 GOTO 580
730 PRINT"{SHFT CLR}{2 CRSR DNs}"
740 IFCA(1)>CA(2)THENPRINTTAB(9)PL$(1);"WINS!!":PRINTTA
     B(9)"WITH";CA(1):GOTO770
750 PRINTTAB(9)PL$(2);" WINS!!"
760 PRINT" WITH $"CASH(2)
770 PRINTTAB(12)"{CTRL 9}{CTRL 6}PLAY AGAIN?{CTRL 7}"
780 GET A$:IF A$="" GOTO 780
790 IF A$="Y" THEN RUN
```

ZAXXON FOR THE C-64!

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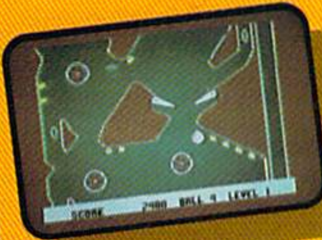
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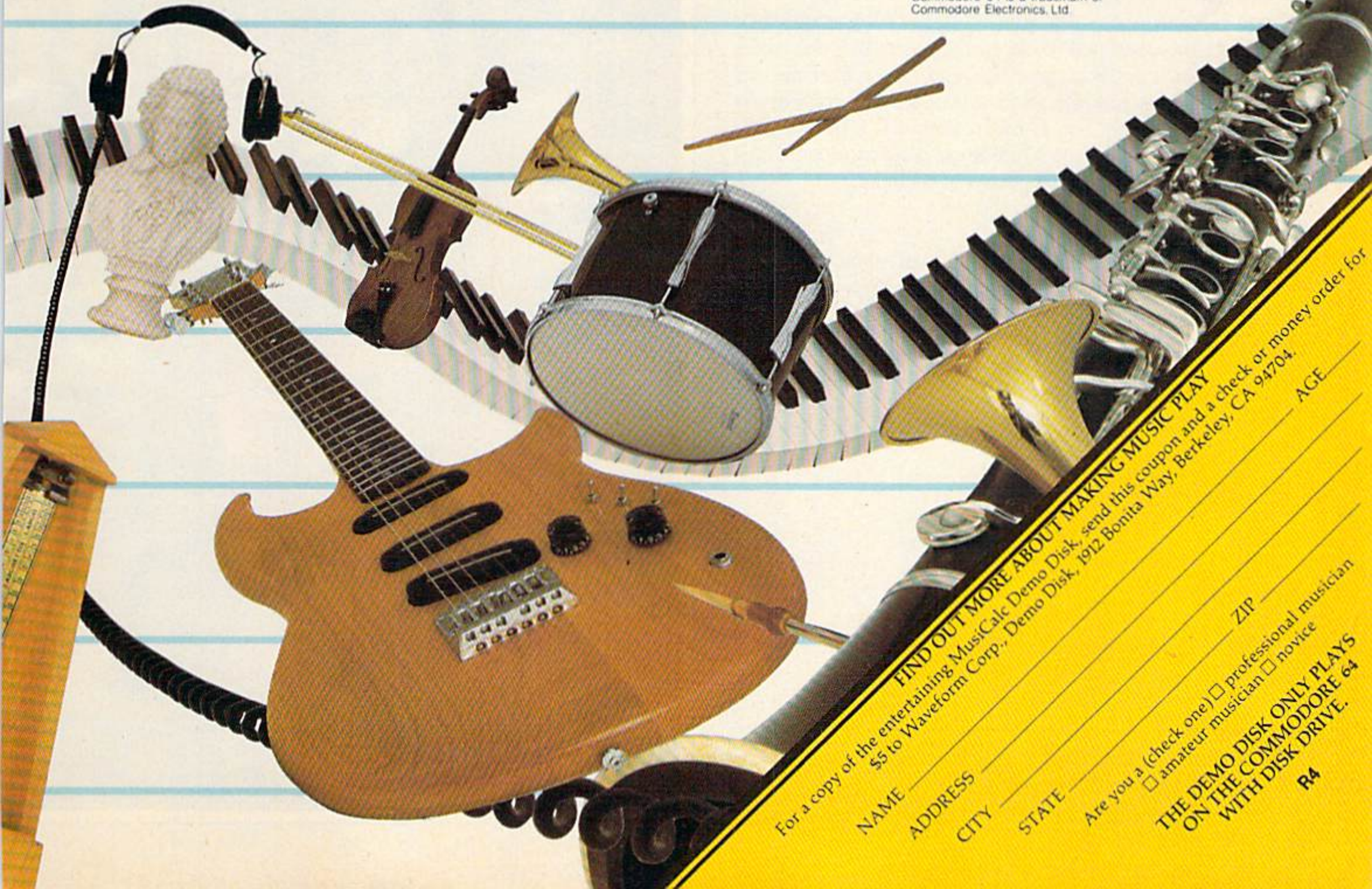

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R4

By Tom Benford

Tune Up Your Commodore

In addition to all the games, complex calculations and practical applications your Commodore computer can do for you, it is also capable of producing music. And it gives you not just "rinky-dink" notes like those of a cheap toy piano, but everything from rich, mellow tones reminiscent of a cathedral organ to "funky" sounds or enough distortion for even the most avid new wave or heavy metal aficionado.

And what sound effects machines they are! Through the marvels of the silicon chip and interactive electronic circuitry, your VIC-20 or C-64 can synthesize virtually any sound you've ever heard.

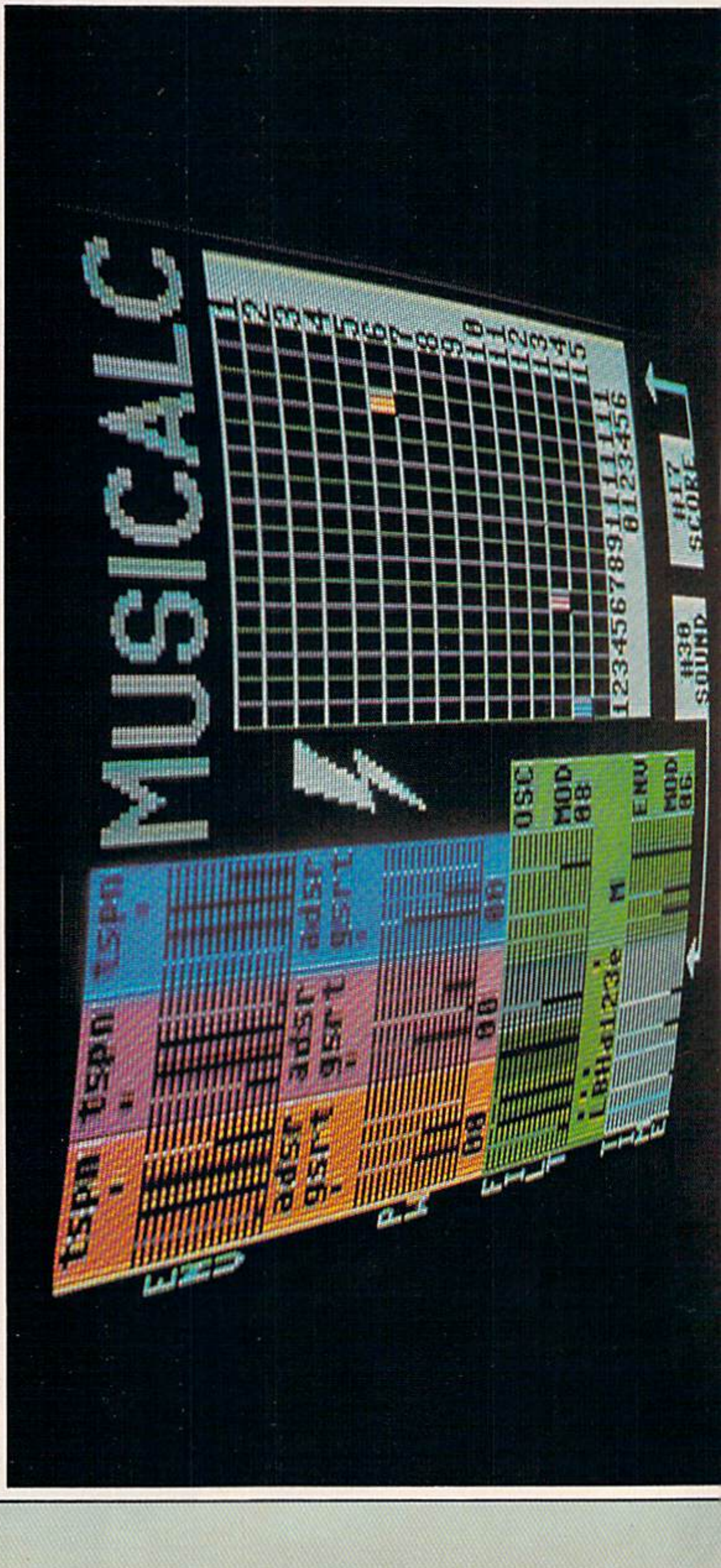
But what actually produces the sounds inside the computer? An electronic circuit known as a tone generator does all the work. The VIC-20 has four tone generators, capable of a five-octave range. Three of them are used for music synthesis, and the other one produces "white noise."

White noise is useful in producing sound effects, but can also be combined with musical tones to alter the way they sound. If you're wondering what white noise sounds like, just listen to the sound coming from your TV set after the station has gone off the air for the night and the screen is full of "snow." That's white noise.

Tone generators are also referred to as voices, since their output can be combined in harmony, much like the voices in a choir. So, in effect, your VIC can create four distinct sounds at once by utilizing all four tone generators. For example, the first three voices might combine into a chord, while the fourth voice (the white noise generator) produces a clicking sound, like a finger-snap or metronome.

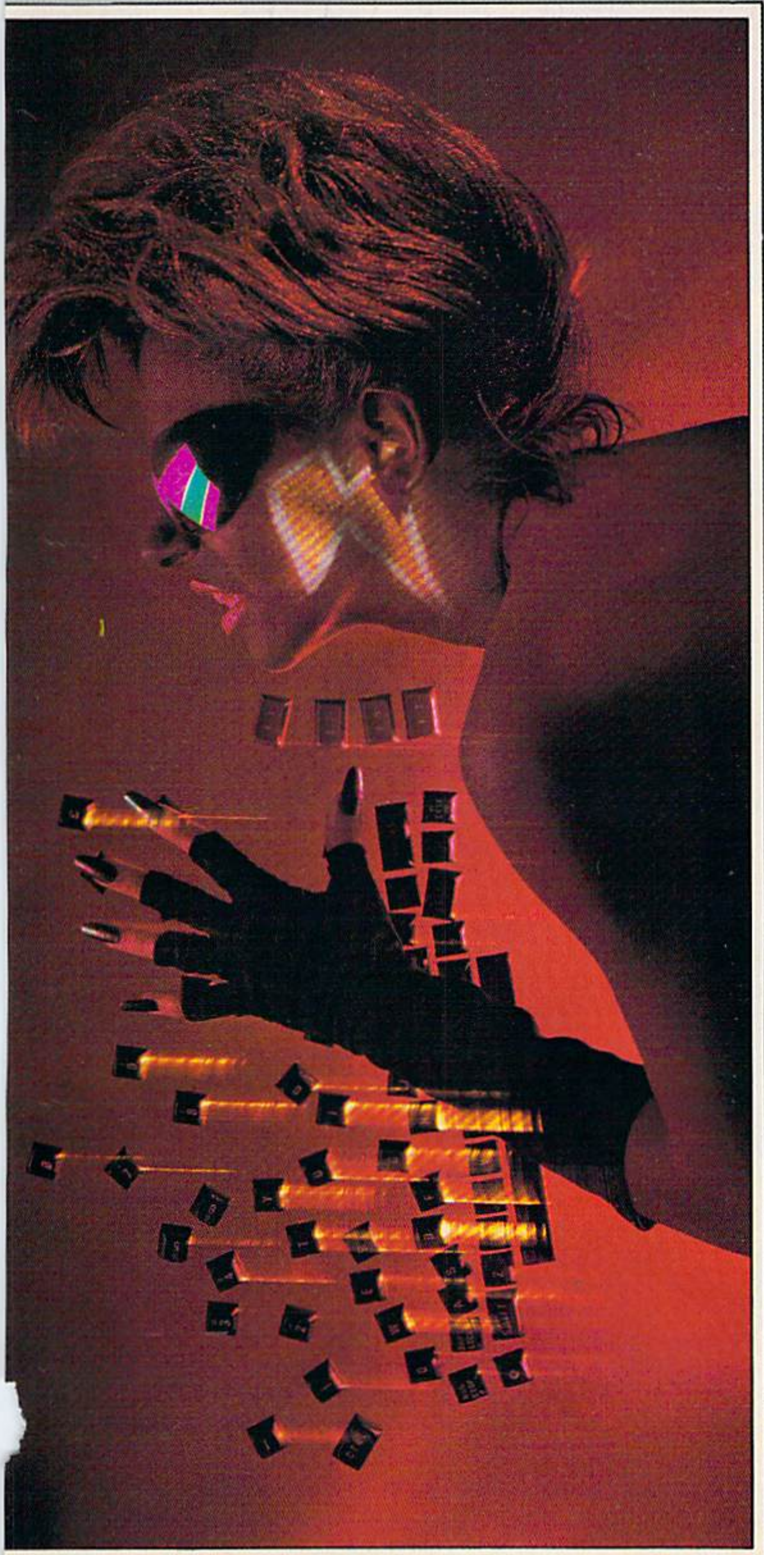
The Amazing SID

The Commodore 64 utilizes a special chip, the SID, which stands for sound interface device. The SID is re-



Address author correspondence to Tom Benford, 520 Havens Cove Road, Bricktown, NJ 08723.

For the Sounds of Your Life



markable, for this one chip is an entire three-voice electronic music synthesizer and sound effects generator, all on a single piece of silicon.

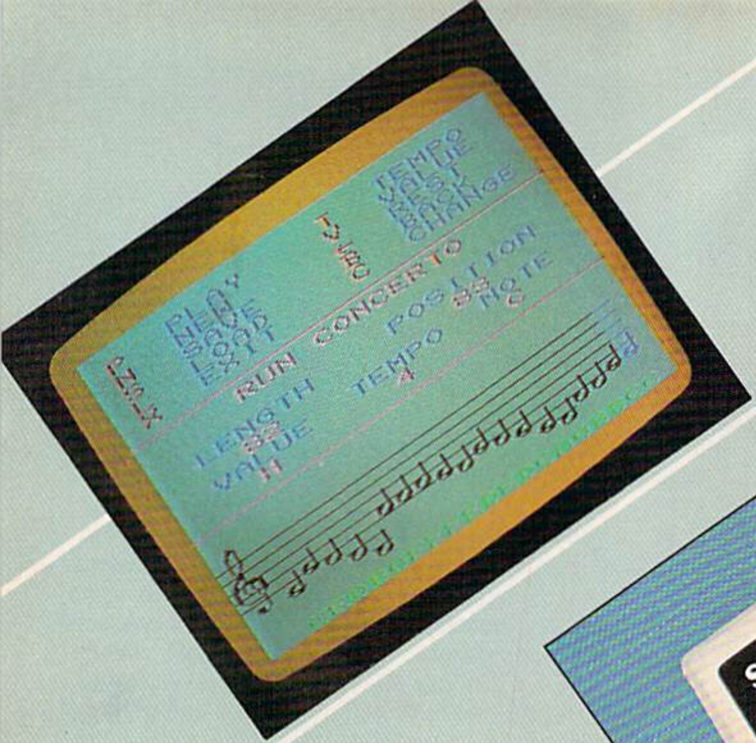
When you consider that the SID chip contains three independent digital tone oscillators (with four waveforms per oscillator), three amplitude modulators, three envelope generators with exponential response, oscillator synchronization, ring modulation, programmable filter, master volume control, a random number modulation generator, two analog/digital interfaces and an external audio input, and packs all of this onto a sliver of reconstituted sand, it seems just short of incredible. But that's what the SID chip does—and well.

If some of the terms used in describing the features of the 64's SID chip sound like an alien language to you, relax. I've included a glossary that explains what's what in the world of electronic music synthesis for those of you who want to learn all the "techie" terms, but I'll try to keep this article in everyday English as much as possible.

You gain access to the tone generators and control them by Poking various memory locations that turn on the voice, control its volume and in general determine what it will sound like. Both the VIC and C-64 user's manuals contain helpful sections on producing sound and music, and their respective programmer's reference guides further explore the subject. Also included in the manuals are the memory maps for each machine, including the locations of the sound registers.

So now you have a little background on how your VIC or C-64 produces sound. If you use a Commodore Super Expander cartridge with your machine, sound synthesis is considerably easier, since many of the sound commands are preprogrammed. By using a Super Expander and devoting a lot of time, you can become a Rachmaninoff of

Photo-montage by Martin Paul.
Product photos by Liz Benford.


PLAY
NEW
SAVE
LOAD
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TEMPO
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REST
BACK
CHANGE
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POSITION
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TEMPO
4
NOTE
C

VIC Music Composer.

Speech Synthesiser
VIC 20
ADMAN ELECTRONICS
MADE IN ENGLAND

VIC-20 Speech Synthesizer.

the computer keyboard.

But if you're impatient and would like to produce some sweet sounds in a hurry, then read on. We're going to examine some of the products that can turn your VIC or 64 into an incredible melody machine, a sound effects factory, or even a talking entity. Would you believe that your VIC or 64 can even sing to you?

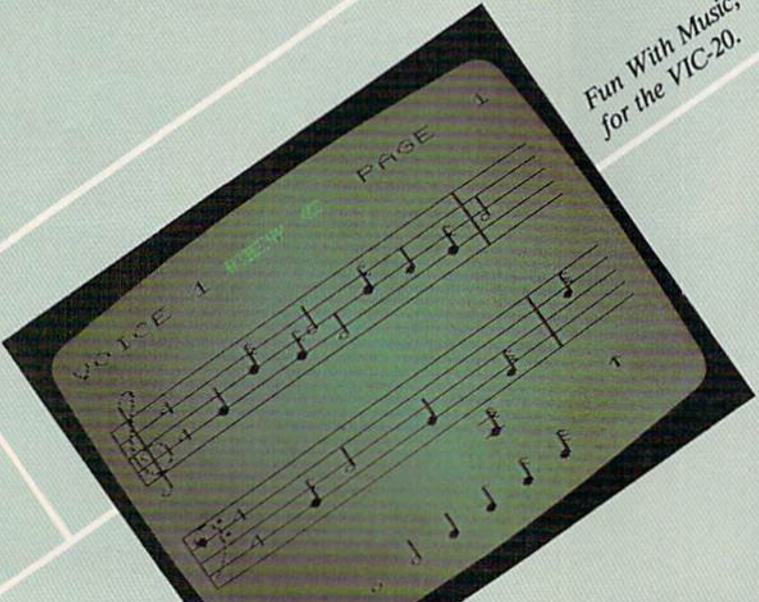
VIC-20 MUSIC SYNTHESIS

VIC Music Composer

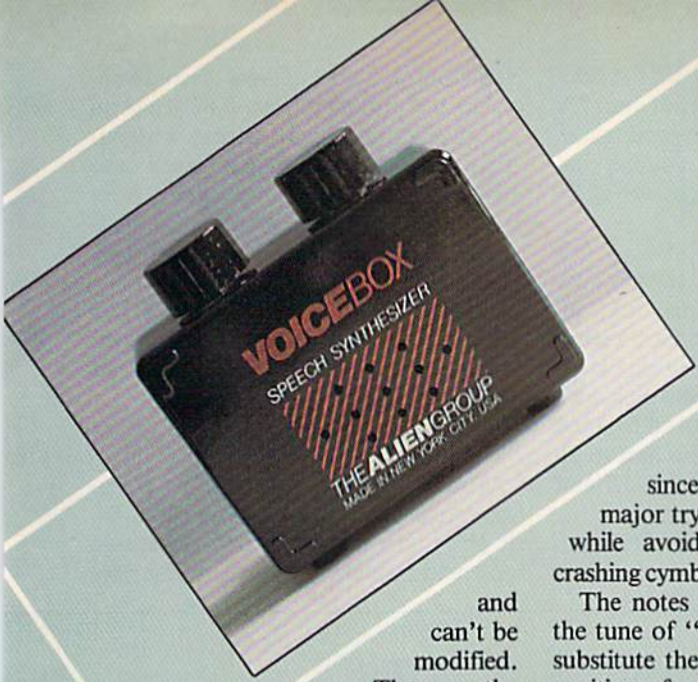
First let's take a look at the VIC Music Composer from Thorn EMI. This ROM cartridge program is ready to use when you turn on your VIC, and it allows you to play as many as three voices at one time, although you must enter each one individually.

The main menu asks if you wish to compose, play, save or load a musical composition. Then you must choose the voice as well as the key and time signature. You enter notes one at a time on the musical staff video display by using the cursor control keys. You also enter rests in this manner. Sharps and flats may be added to the placed notes, and you create bar lines to separate measures by hitting the B key.

In the compose and play modes, only one voice will be represented on the scrolling staff, although you may be hearing two or three. Also, the tones of the voices are set to a reed organ sound,


VOICE 1
PAGE
1

Fun With Music, for the VIC-20.



The Voice Box, for the VIC-20 and C-64.

and can't be modified. These are the only two areas where I found the VIC Music Composer wanting.

An important function of the program is saving your compositions to tape or disk. You can store a partially completed piece and call it back later to finish or modify it. The program also allows you to store completed compositions so you may replay them anytime you wish.

The VIC Music Composer is very easy to use and lets you produce nice three-part-harmony compositions without any prior knowledge of music. The documentation booklet is thorough, yet concise and easy to understand. It's a good music program for computer musicians of all ages.

Fun With Music

Epyx Computer Software brings you Fun With Music for the VIC-20. Like the VIC Music Composer, this is a cartridge-based program. A novel twist of Fun With Music is that the cartridge includes a musical game you can play when you're not creating musical masterpieces. Provision for saving your compositions to disk or tape is also included.

Another nice feature is a scale card that sits in back of the row of number keys on the VIC. It identifies each key that will produce a sound and gives its equivalent name on the musical staff. You control note values, tempo, rests and placement on the staff through various keys on the VIC, and the video display shows a representation of the staff, as well as other information.

Of the two music programs mentioned so far, Fun With Music is the easier to use and the more fun, particularly for younger musicians. The game feature adds to the enjoyment of learning about music, since the scenario is a drum major trying to strike musical notes while avoiding a hungry dog and crashing cymbals.

The notes move along the screen to the tune of "Dixie," but you can even substitute the notes of your own compositions for the theme of the game! Paddles are recommended.

The documentation booklet supplied with the cartridge is straightforward and easy to understand. The sheet music for four traditional melodies is included, as well as the "Dixie" demo. Entering, editing, storing and playing back your musical compositions is extremely easy, even for youngsters, and the program teaches music in a painless manner. Epyx hit the nail on the head when they named this program, because it really is Fun With Music. Highly recommended, especially for very young computerists.

SPEECH SYNTHESIS

VIC-20 Speech Synthesizer

The VIC-20 Speech Synthesizer is produced by Adman Electronics, Ltd., in Great Britain, and distributed by Maxtron of El Monte, California. This unit is a cartridge with two cable "pigtails." The cartridge is inserted into the VIC's expansion port. The male pigtail is inserted into the monitor or RF port on the computer, while the RF or monitor cable is plugged into the female pigtail.

The ROM-based program is active upon power-up. As you press each key, its letter is audibly voiced by the Speech Synthesizer as well as displayed on the video screen—and the pronunciation is quite good. You can initiate Basic programming while the cartridge is in place, and speech synthesis is instituted by invoking the SYS41000 command.

Allophones are individual speech sounds. A phoneme is a grouping of allophones. For example, take the phoneme "P." The P sound differs depending on its place within the word. Peter has a different P sound than apple, and apple's P sound is different from the P in wasp. These three different P sounds are all allophones of the phoneme P.

The VIC-20 Speech Synthesizer utilizes allophones to create realistic-sounding speech. Allophones sound differently than the phonemes under which they are grouped, however, and that must be taken into consideration when keying in words for the VIC to pronounce.

An example of this would be the word "hello." To enable the VIC to speak, it would have to be entered as "H/E/LL/OO/". The slash marks act as separating links for the allophones, so that by separating and linking the individual speech elements of "H/E/LL/OO/", the word hello is produced. All that's really required is that you think in terms of sounds rather than letters.

Although the speech is entirely understandable, it lacks intonation and character because there is no pitch control. It's a "computer voice" that should satisfy the needs of most VIC users who want to make their computers converse with them. The documentation supplied with the unit is in the form of a booklet, and it's thorough and easily understood.

It also provides a wealth of information on the technology of speech synthesis as well as several different programming means of incorporating speech into Basic programs. Perhaps the most desirable feature is that through the use of allophones, the vocabulary is unlimited, since you can create any word by using the correct allophone components.

To sum it up, the VIC-20 Speech Synthesizer is an excellent cartridge-based voice synthesizer that's easy and fun to use. It provides good quality synthetic speech capability for the VIC.

The Voice Box for VIC and C-64

The Alien Group has produced the most awesome hardware/software combination for voice synthesis that I've seen yet. The hardware end is actually the Voice Box, a small black box that plugs into the user port of either the VIC-20 or Commodore 64.

This is a great feature in itself, since the same hardware works for both computers. If you have both a VIC and a C-64 (like myself), then you need different driver software for the two machines, but only one Voice Box. It's also a point to consider if you now have a VIC and you eventually intend to upgrade to a 64. The driver software can be either cassette or disk-based, and the Alien Group supplies it in both media.

Using the Voice Box with a VIC is easy, and the results will amaze you. Standard programs included with the Voice Box are TypeTalk, which produces an "Alien" face "speaking" text that is entered via the keyboard; the PSpeak, FSpeak, and Speak programs that allow your Basic programs to contain speech commands through different access means; Daisy, which sings the first verse of "A Bicycle Built For Two;" and Spell, which is a spelling quiz program.

Variable inflection control of the Alien "voice" is achieved through certain keys that will either raise or lower the inflection level, thus producing very lifelike speech. The Voice Box also has two knobs on it, one controlling the overall pitch, or timbre, of the voice, while the other controls the volume level.

An external output jack is also provided that allows the voice to be output through your stereo system or a musical instrument amplifier. You don't use the speaker of the TV or monitor for speech reproduction at all, as the Voice Box contains its own speaker. The documentation booklet supplied with the Voice Box is absolutely first-rate in its thoroughness and user-friendliness.

As I mentioned, you can also use the Voice Box with the Commodore-64, and when you do, it's a whole new ball game. In addition to containing all the same programs as the VIC software, but in a more refined form, it also provides musical accompaniment to the singing Voice Box programs.

Moreover, it gives you various additional programming utilities that greatly enhance speech programming and an optional phoneme dictionary disk that automatically translates keyboard input from literal to phonetic spelling. In most cases, the Voice Box will produce accurate-sounding pronunciations of keyboard entry words, but there are some exceptions that you should enter phonetically, so they'll sound correct when played back.

The optional Music program turns the C-64 into a first-class music synthesizer, and the Alien Group has done a bang-up job of programming features into their software. By using the built-in speaker of the Voice Box for the "vocalization," and the speaker of your TV or monitor for musical reproduction, you can have independent volume control of the voice and music, as well as total cut-off of either one.

The absolute show-stopper of this package is the animated singing face program and the sample melodies included. The hi-resolution face resembles Abe Lincoln, and while watching it and listening to "The Star-Spangled Banner," you're almost moved to stand up at attention! You are also able to alter the face if you decide that Honest Abe isn't your cup of tea.

Extensive control over the sound generation and filtering allows countless variations for the musical accompaniment and sound effects. The icing on the cake is that all your settings and musical/visual creations may be saved onto disk or tape. Once again, since phoneme creation of the words is the basis of the synthesis, vocabulary is virtually unlimited.

Bravo, Alien Group. The Voice Box is the *tour de force* voice and music synthesis package, and I highly recommend it for both the VIC and C-64 user.

Magic Voice

The Magic Voice module by Commodore is intended for use on the C-64. It plugs into the computer's expansion port and provides an auxiliary cartridge

Glossary of Synthesizer Terms

Here's a list of terms often used in describing sound synthesis. It's by no means complete, but it covers the most commonly used terms and gives a brief but accurate definition of what they mean.

ADSR—Attack, Decay, Sustain, Release. ADSR as a group determines what the sound will be like (see the individual definitions for each of these components below).

Amplitude—the strength or volume of the signal (how loud or soft it is).

Attack—the amount of time it takes for the sound to start, as in hitting a key on a piano or plucking a string on a guitar. The attack determines how much time it takes for an event to go from silence to sound.

Band Pass Filter—filters out all frequencies above and below the preselected range or band. In other words, the frequencies within the band are allowed to pass through, while those above and below it are filtered out.

Decay—Once the attack portion is completed, the decay determines how quickly the sound begins to deteriorate.

Envelope—refers to the shape of the sound (the combination of ADSR values) and determines the way you will perceive the sound; e.g., a trumpet's envelope is different from that of a violin.

Filter—In much the same way that a coffee filter prevents the grounds from getting into your cup, filters screen out certain portions of the sound wave. There are several different kinds of filters, and each one screens out a different portion of the overall sound.

Frequency—In general terms, this determines how high- or low-pitched a sound might be (not how loud or soft). A soprano has a higher frequency range than a baritone.

Cut-Off Frequency—determines where a filter will start doing its work (where to start cutting off the sound wave).

High-Pass Filter—As the name implies, this type of filter will allow high frequencies to pass through while cutting off low frequencies. The cut-off frequency determines what portion of the sound doesn't pass through.

Low-Pass Filter—the opposite of a high-pass filter; the lower frequencies are passed through, while the higher frequencies are stopped. Once again, the cut-off frequency determines what goes through and what doesn't.

Modulator—a control that allows you to tailor portions of a sound, such as its high or low frequencies.

Noise—a random-pattern sound wave. White noise is the most common (the sound of a channel on your slot, eliminating the need to remove it when you want to access a game or utility cartridge. Several new products from Commodore, such as the Gorf and Wizard of Wor game cartridges, as well as the Magic Desk II home utility cartridge and preschool educational cartridges, have speech capability when used with the Magic Voice module.

The Magic Voice unit has a 235-word vocabulary built in, but this is somewhat deceiving, since the numerals from one to ten are considered words, as are the individual letters of the alphabet and parts of words such as "th" and "ing." Among other words of limited use included in the alphabet are "Commodore" and "Capital."

A very useful feature of the module, however, is the addition of the Basic command Say. You can use Say to make the computer utter a phrase enclosed in quotes (providing, of course, that the words are included in the vocabulary). By the time you read this, Commodore will have released its Magic Voice Vocabulary disk, containing a 10,000-word vocabulary, and allowing you to store words of your own creation on the disk. In case you're wondering, vulgarities will not be included!

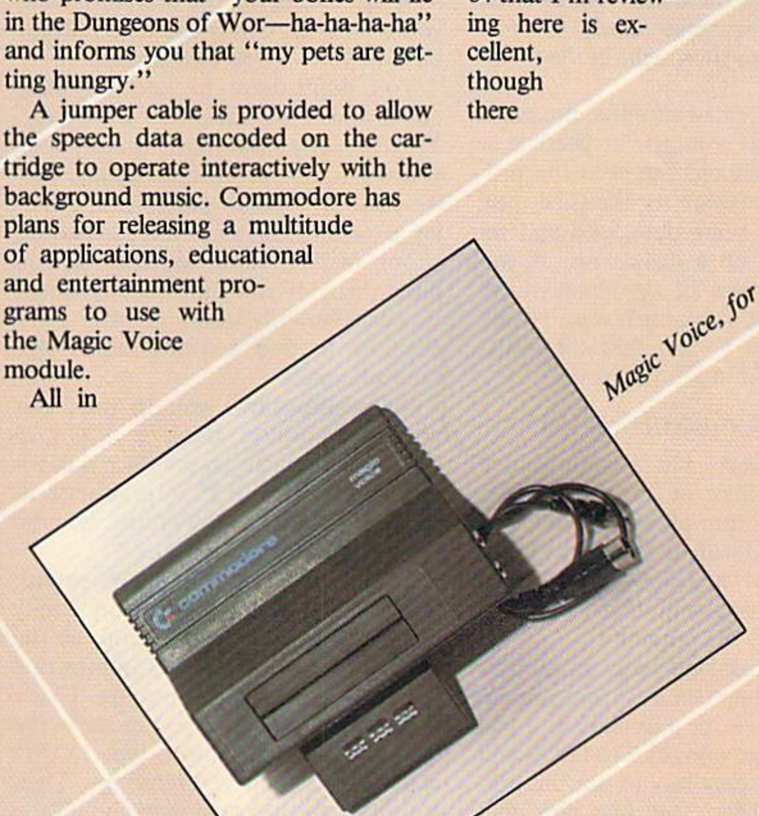
The "natural" speaking voice of the module has a friendly-sounding female timbre, complete with inflections. Emphasis on words like "terrific" adds to the user-friendliness with enthusiastic ambiance.

According to some of Magic Voice's designers I spoke with at Commodore, they opted for the "female" voice because it sounds friendlier to preschoolers using it to learn their ABCs. It certainly is a unique sound!

This soothing and enthusiastic female voice can be drastically altered into a menacing male timbre by inserting the Wizard of Wor cartridge into the auxiliary slot. Say "bye-bye" to the nice lady and "hello" to the awful Wizard, who promises that "your bones will lie in the Dungeons of Wor—ha-ha-ha-ha" and informs you that "my pets are getting hungry."

A jumper cable is provided to allow the speech data encoded on the cartridge to operate interactively with the background music. Commodore has plans for releasing a multitude of applications, educational and entertainment programs to use with the Magic Voice module.

All in all, Magic Voice is very easy to use, although its on-board vocabulary is extremely limited. However, if you use it with the appropriate speech cartridges, it should give you a valuable educational tool as well as providing entertainment and practical voice prompts for applications programs. The female voice is definitely a nice touch.



Magic Voice, for the C-64.

TV set after the station has gone off the air for the night is an example of white noise). Pink noise is another variety, produced by changing the octave and/or rate of the wave.

Pulse Width—In simple terms, every sound is made up of waves that rise and fall. The period of time between the crests of the sound wave (often thousands of crests per second!) determines the width of these crests, or pulses. It also refers to the voltage levels associated with these waves, but that gets a bit technical.

Release—another component of the ADSR/envelope package. The release determines how much time will elapse to go from sound back into silence.

Resonance—describes how mellow or "tinny" a sound is. The combination of the envelope components and the filters determines the resonance. Timbre is another term that's frequently interchanged with resonance in describing a sound.

Sequence—a pattern of notes, usually to be repeated later on in the composition. Sequencers replay these patterns a predetermined number of times.

Sustain—denotes a level that will be held or "sustained" as part of the overall sound envelope. Note that sustain describes a level, but attack, decay and release describe time values.

Waveform—If you could see a sound, you'd see its shape. There are four distinct soundwave shapes, or forms—square, sawtooth, triangular and noise. Each different waveform has a direct effect on what kind of sound you will hear.

TB

COMMODORE 64 MUSIC SYNTHESIS

The Commodore 64, owing to its SID chip, is capable of producing sounds rivaling those of a professional-quality dedicated music synthesizer costing several thousands of dollars. Just this feature alone more than justifies its purchase price, and that's why more amateur musicians have C-64s than any other personal computer.

Another reason for the overwhelming acceptance of the 64 as a serious musical applications tool is the abundance of high-quality music synthesis and sound generation software now on the market. Every music program for the 64 that I'm reviewing here is excellent, though there are, in my judgment, varying degrees of excellence, depending mainly on ease of use and documentation quality.

Most of these programs also contain provisions for printing out your musical compositions, and this is a boon to composers and arrangers. Potentially, this can relieve a lot of the drudgery of music writing, and it's a point to consider when seeking a music program that's right for your needs. I say potentially because, once again, some are easier to use than others.

Another point to consider is whether your needs will be satisfied by using preset sounds, or whether you'll actually need to create or simulate sounds to get the effect you want. While all of these programs provide some degree of "sonic tailoring," you are limited to preset sounds on some programs, while others allow you to customize the sound in unlimited variation.

Previous musical experience also has to be considered. Some of these programs don't require any knowledge of music at all, and they'll allow you to produce music as soon as they're loaded. Other programs will be more effective for those who can read music and understand musical notation; but the beginner, with a little patience, can have a good time with these also. All of these programs offer some music tutorial, from modest to thorough, in the documentation.

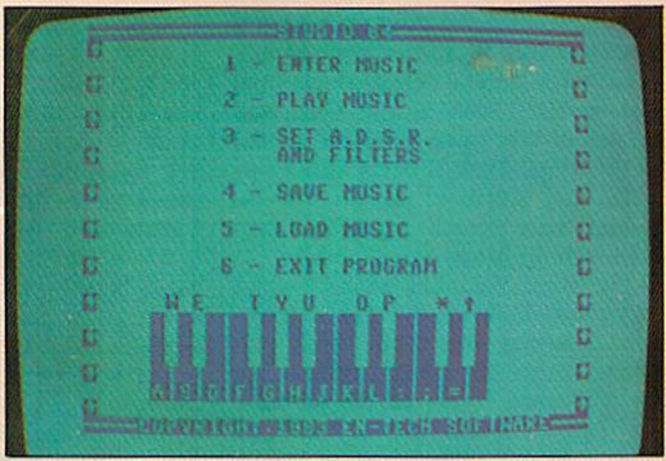
Lastly, this review of music programs for the 64 is as complete as possible at the time of writing, but with the proliferation of software for the C-64, new programs are being developed and released almost on a daily basis. If you don't find a review of a program you've heard about, it's because it wasn't available at the time I wrote this; it'll probably be reviewed in a future issue.

Music Construction Set

Electronic Arts has a sure winner with the Music Construction Set (MCS). The author of this ingenious approach to producing music on the Commodore 64 is a fellow named Will Harvey, who was only fifteen years old when he wrote the program!

MCS is a disk-load program, and its most outstanding feature is that you use a joystick with it, or a KoalaPad, if you have one. I used a joystick to test it, and found this an easy way to use the program. Essentially, you just pick and point to do what you want.

The video display shows three musical staves, and the lower half of the screen is filled with symbols, or icons, of notes, rests, sound values and various other artifacts. A pointing hand icon does all the work, guided by either your joystick or KoalaPad.



Studio-64, for the C-64.

Creating music with MCS is as simple as moving the hand down to select what kind of note you want (whole, half, quarter, etc.) and placing it where you want it on the staff. As you choose your note, you hit the fire button and then release the note where you want it by pressing the button again. As the note is placed, you hear it.

At any time during the composition, you may hear what you've created by moving the pointing hand to the piano icon and hitting the fire button. Presto, your musical composition is played back to you—it's as easy as that!

You don't have to know a thing about music to use MCS effectively. You can copy sheet music for any song you wish onto the MCS staves and play it back. Or you can experiment, plinking around by ear, since you can remove wrong or sour notes as easily as you place them. If you want to sing along, you can instantly transpose your compositions to find a comfortable range for your voice.

MCS also allows you to print out your composition using a VIC-1525 Graphic Printer or an interface that totally emulates the 1525. A printout is as easy and painless as composing, and the print resolution is excellent.

Storage of your compositions to disk is quick and easy as well. You simply move the hand to the disk icon, hit the fire button and type SAVE and the title of the piece at the arrow prompt. That's it. To retrieve a piece, you move to the disk icon, hit the button, type LOAD and the title, and you're all set. Then you move to the piano icon and hit the button again to play your piece. What could be more simple?

There are thirteen preset sounds included on the program. These include harpsichord, oboe, organ, brass, flute and others, including percussion sounds. They should be sufficient for your applications. It would be nice if you could further tailor these sounds or synthesize new ones, but alas, nothing's perfect. This is the only limiting factor of MCS, and even this isn't a major drawback.

There is a feature called Cut and Paste that allows you to cut out a section of the musical score and paste it in anywhere you want within that score—or any other, for that matter. What a time-saver this is, especially if you want to repeat certain sections of a tune, such as a chorus or refrain.

You can even create entirely new compositions by cutting and pasting together pieces of other songs. Once again, the icons make the task simple: you use the "scissors" for cutting and the "glue bottle" for pasting.

If you're looking for a music program that's painless, offers every major feature you could ask for and doesn't require you to be a Leonard Bernstein, then Music Construction Set is definitely for you. Congratulations to both Will Harvey and Electronic Arts for a truly outstanding music program for the C-64!

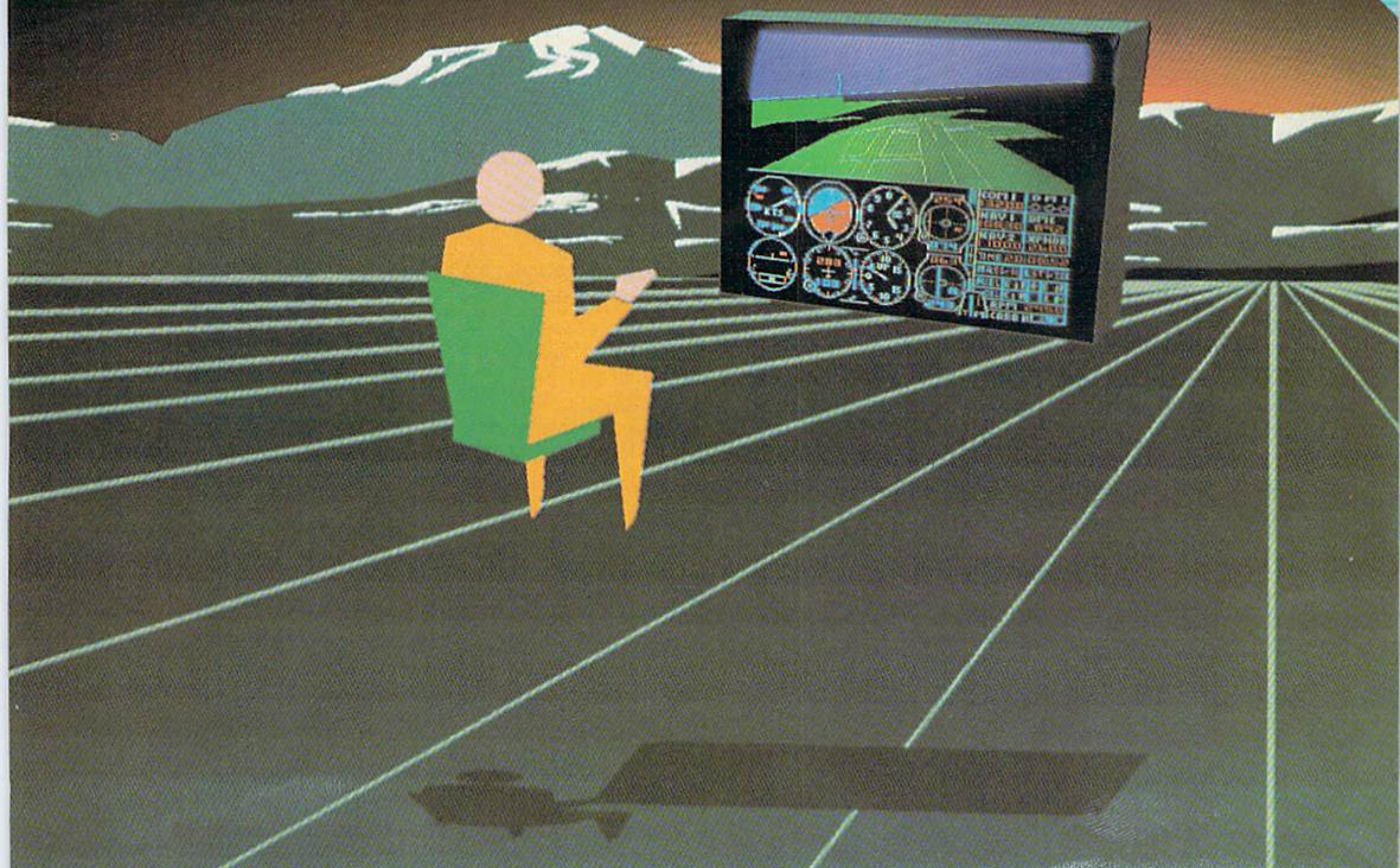
Studio-64

Studio-64, from En-Tech Software, is the next item on our musical menu. This program is available on either disk or cassette and has the same features on both media (I used the disk version). In the concise but thorough user's manual supplied with the program, En-Tech describes Studio-64 as "a powerful word processor for music, not just a simple sound-maker." I must say that this definition is a fairly accurate description of the product.

The utility features of Studio-64 include the entering, editing and playback modes; sound customizing through setting the ADSR and filter controls; and

Flight Simulator II

For the Commodore 64™



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saving compositions to disk or cassette for future playback or editing. No provision is made for printing out musical scores on a line printer, although En-Tech plans to release a program in the near future that will do this with Studio-64 (it may be available by the time you read this).

All note entry, duration values, rests, tonal qualities, etc., are done via the keyboard. Three-part harmony is possible, with individual volume and tonal characteristics for each voice. Although it's not as direct or simple as the MCS, it's still a very easy program to use, and it produces excellent results.

The real strength of Studio-64 is the provision to customize the sound of your music through the alteration of synthesizer settings. The program also has the capacity to store approximately eight minutes of music for all three voices (combined), which is more than enough time for all but the longest compositions!

Studio-64 offers an excellent compromise between ease of use and the facilities to create virtually any sound or tonal characteristics desired. Pitch representation on the video screen is limited to a range from middle C to G sharp one octave above; higher and lower notes are possible through hitting other keys on the keyboard, but the staff doesn't show the actual pitch, even though it sounds correct. This part is a bit tricky to get used to, and you may not care for this at all.

Another eccentricity of the program is that flats must be represented as sharps of the natural note one tone lower. This is really a pain in the neck, especially if you don't have a reasonably thorough working knowledge of music. The conversion process is adequately explained in the manual, but it's still confusion city until you get used to the conversion.

Apart from the limited visual representation of the musical score and the sharp-flat oddity mentioned above, Studio-64 offers you diverse tonal modifications and a great amount of music data storage while you're working on a composition.

En-Tech's promised score-printing module will round out one of the rough edges, but I can't help wondering if the printing will be limited to the same middle C to G sharp range as the video display; if it is, it will be next to useless. If, however, it does reproduce actual tonal representations, it will be a valuable music package.

In the meantime, if you feel you can live with the idiosyncracies of this program, you'll be pleased with the flexibility of the sound-coloring controls as well as the massive amount of working room for scores within the program.

The preset instrumental sounds are excellent, and the synthesizer controls allow virtually unlimited mixing of sounds, including effective percussion effects. Apart from the above-mentioned quirks, Studio-64 is an impressive program worthy of serious consideration when you're purchasing music synthesis software.

MusiCalc

Waveform Corporation has produced the MusiCalc series of modular sound-synthesis programs, and it's really heavyweight stuff! Heavyweight is an appropriate term, since it accurately describes the extensive capabilities of the system as well as the myriad applications it can support.

Module 1 of MusiCalc is the Synthesizer and Sequencer disk, Module 2 is the ScoreWriter disk and Module 3 is

MusiCalc
2
waveform

MusiCalc, for the C-64.

Playing

You don't have to purchase dedicated software to explore the sound/music synthesis capabilities of your C-64. If you're basically an adventurer and experimenter, then all you really need is your 64, the owner's manual and a copy of the *C-64 Programmer's Reference Guide*. Armed with these, you can journey into sonic adventureland and produce all kinds of interesting sounds.

However, both of the Commodore books mentioned above are ambiguous, at best, when it comes to utilizing the SID chip to best advantage. For example, they mention that the chip will accept external signal input, but nowhere do they clearly tell you how to access this capability.

Not one to be thwarted when I'm really on to something, I decided to make a few phone calls to people who are infinitely more knowledgeable about these matters than I. This is what I discovered:

The following program tells you how to access the SID chip to read external input. These are only opening values, though, so you'll still have to do some book work to find out how to set the filters up and how different values will affect the sounds you produce. But it's a start, and a good one at that.

```
10 SID = 54272
20 POKE SID + 23, 128 + 8
30 POKE SID + 24, 32 + 15
40 POKE SID + 22, 128 + 2
```

After you type this in, save it to either disk or tape. What you have here is the information that both the user's manual and *Programmer's* the Keyboard-Maker disk. Two Template disks—African and Latin rhythms on one and new wave and rock on the other—are also available. Additionally, Waveform offers a demo disk that demonstrates the capabilities of MusiCalc, as well as their "Technopop" disks, which are recordings of current hits, old standards and even Christmas music that you can play on your computer.

They also intend to release a keyboard and software package called MusiCalc 4 that will work interactively with the MusiCalc 1 and 2 modules. This module will enable you to play music on the keyboard and record it on disk to play back or print out later. It will also let you play any scale in any key, which will greatly enhance the musical capabilities of their already-impressive modular software.

Before I describe the features of the individual modules, I must mention the singular innovation of MusiCalc that makes it a stand-out among other music packages.

The SID chip in your C-64 will accept external input via the audio/visual port on pin #5. In short, this means you can introduce sound into the computer—for instance, by a microphone or electric guitar—and use the C-64's SID filters, oscillators and other controls to tailor and change the sound.

The C-64 user's manual and the *Programmer's Reference Guide* mention that this is possible, but that's about all; neither book provides information about utilizing this feature. Waveform has taken the bull by the horns and has included in the MusiCalc 1 module a provision to accept external input and process it through the software synthesis controls. This is a great boon in creating music, especially if you're guitar-oriented, rather than a keyboard specialist.

I'm eagerly awaiting the release of Waveform's Colortone Keyboard and MusiCalc 4 package. What a blessing it will be to think in pure musical terms while playing on a piano-like keyboard, rather than in typewriter/music notation, where G sharp is the R key. I can hardly wait!

To get on to the MusiCalc system itself, Module 1 is the master module, the heart of the system. This program turns your C-64 into a three-voice synthesizer and fully-interactive stepping sequencer. The sequencer feature allows you to repeat sequences or patterns of a musical score over and over. All note entry is done via the keyboard, and you enter the synthesizer panel in the same way.

There are over 70 tonal controls in the synthesizer section, including modulators, transposers and waveform controls, with "sliders" to control their values. The sliders are simply lines that can be moved up or down to increase or decrease the values of the control settings. The disk includes a massive assortment of sample sounds and musical scores.

Module 2 is the ScoreWriter disk. This disk works in conjunction with Module 1 to change your compositions and improvisations into musical notation represented on the traditional staff. It also allows you to print out your music on a graphics line printer with a minimum of fuss and bother. It does not work alone, however, since it is interactive with the Module 1 disk. Printout quality is excellent.

Module 3 is the Keyboard-Maker disk, and it enables you to create your own custom musical keyboard configurations on the C-64 according to your needs. This module comes with over 30 preset keyboard scales that accommodate just about every musical form, from classical to rock, and you can custom-tailor the keyboard if you find none of the presets adequate. Once again, this is an interactive disk, so you need Module 1 to use these features.

The Template modules are interactive overlay programs supplied on individual disks. Template 1 contains

Continued on p. 134.

with SID

Reference Guide neglect to tell you.

You'll also need some way to access pin #5 of the audio/visual port on the back of your 64. I strongly suggest you use the Sound Box from HES, which allows external input via an RCA-type jack.

As an alternative, you can rig up your own connector, using parts from Radio Shack or a comparable supplier. But if you're not adept at soldering, I don't advise this, because you can really mess up your computer if you make the wrong connections. Also refer to the user's guide and programmer's guide for input voltage values—you might fry your SID chip if you try to force-feed it too much juice.

Once you have a suitable connection to pin #5, you're all set to plug in your guitar, microphone or other device (but watch that voltage!) and use the SID's capabilities to process and filter the signals you're sending into it. It'll take a lot of experimenting, but that's part of the fun.

You serious programmers out there should find it quite easy to add some lines to the Basic program I've provided to sequentially increment or decrement these starting values by means of a loop. If anyone comes up with something that he feels is really great, I'd love to hear about it. Drop me a line describing what you've done, as well as either a program listing or a copy of it, and we'll publish the best efforts in a subsequent issue. (If you do submit a program on disk or tape and you want it back, please provide a stamped envelope large enough to handle it; otherwise, it becomes a "keeper"!) All submissions of this nature should be addressed to:

Tom Benford/*RUN*
PO Box 125
Osborneville, NJ 08723

I'd like to publicly thank Mick Fitzgerald of Waveform, Inc., as well as Nancy Nieradka for their kind contributions.

Thanks are also in order to Steve Finkel and John Mathias at Commodore for their help (and patience with me and my numerous phone calls) while I was researching this article.

While I'm at it, I might as well thank all of the manufacturers and distributors who submitted their software and/or hardware for evaluation, as well as their technical assistance where needed.

And a very special thank you goes to the "kooks" at the Alien Group, who provided a wealth of knowledge and data on speech synthesis.

On a parting note, let me mention that neither I nor *RUN* will be responsible for any damage to your computer or other equipment resulting from trying to rig up external input devices. This information is presented solely for your edification, and if you don't understand what's going on with the A/V port, then you shouldn't mess with it! In any event, do have fun with your computer music and sound synthesis experiments, 'cause that's what it's all about.

TB

THE HYPNOTIST

Can you be hypnotized by a microcomputer? Well, this author didn't think so either...until she met the magnificent Kurian, who can dazzle you with his mystifying powers of suggestion and help you relax, correct bad habits, induce regression, and so forth, through hypnosis. You'll fall under his spell.

By Christine Adamec

The Hypnotist
(Disk and PSI Biofeedback Device)
Psycom Software International
2118 Forest Lake Drive
Cincinnati, OH 45244
Tel: (513) 474-2188
Price: $87.95 disk

Address author correspondence to Christine A. Adamec, 381 SW Ardmore St., Palm Bay, FL 32907.

Does the word *hypnosis* give you the shudders, as you imagine a mad scientist gleefully intoning evil orders into the mind of the helpless (and beautiful) maiden?

I once thought hypnosis was pretty weird, too, but a couple of years ago I decided to try it to lose some excess weight. I saw a hypnotist twice and lost thirty pounds within about two months. And I kept if off, plus or minus three pounds.

So when I heard about a self-hypnosis computer program written by a professional hypnotist, I was fascinated. Could a computer really hypnotize a person? Maybe I could help my husband reduce his blood pressure, and maybe I could become truly slim, instead of just average.

Then came the holiday season. I gained seven pounds! Horrors! Time to try out Kurian, the guy with the big starey eyes in the beginning of The Hypnotist program.

Before describing the program in detail, let me explain that The Hypnotist isn't just a program etched on a floppy disk—it also includes an electronic biofeedback device.

This lightweight hardware plugs into Port I of your C-64, and you strap the other end around your wrist like a watch, with velcro making it stick together. You place your little finger into a loop (the sensor mechanism) connected to the strap and you're ready—the computer will use this device to take your pulse!

If you want to calm down, the computer will help you concentrate on lowering your pulse, and, theoretically, your stress level, too. When you're relaxed, you're a much better subject for hypnosis.

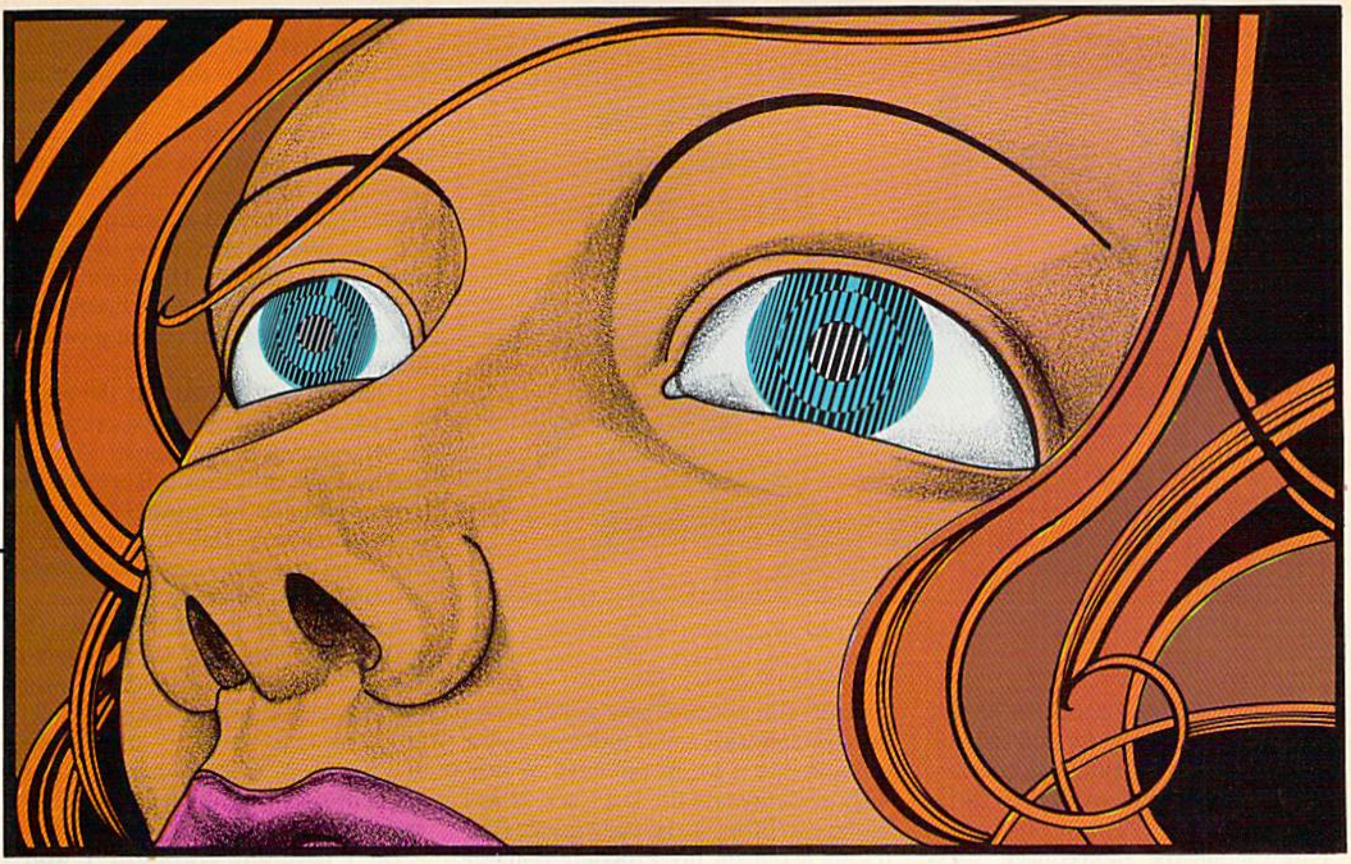
Look Into My Eyes

After you've read the step-by-step manual to get an idea of The Hypnotist, load the program and meet Kurian, a head and shoulders picture of an Egyptian—outstanding graphics! Kurian's your hypnotist, and he'll provide all your instructions in printed words (Kurian can't speak aloud, though his lips move).

Kurian first wants to know your name, then what you want of him: habit control, regression, superlearning or biofeedback stress control. I started with habit control, and Kurian asked me for three names of my habit.

Positive thinking works better for me than negative, so I decided to call my habit food control instead of pigging out. I also called it nutritional balance, but that was too long for the computer, which called it nutritional bal, or something like that. Next time I shortened it to nutrition. Exercise was another associated habit I wanted to engrain.

Next, I was asked if I wanted the positive, negative or alternative suggestion method; I selected positive, so as to remain consistent. I didn't want to pair food control, one of my habit words, with negative words like disgusting.



If you prefer to call your habit a negative word, like obesity or fat, then you should select negative words to match them. Of course, you can use neutral habit words; for example, the manual suggests smoking with tobacco and cigarettes, in which case you could select any suggestion method.

If you choose the alternative option, your habit words will be paired with activities, such as sailing, fishing and reading—replacements for overeating, smoking and so on.

Another choice: Did I want my habit words matched to Kurian's or to my own stimulus words? I tried both, in different sessions. I used words like strong, healthy and happy. Kurian used words like dancing, singing, liberated and playing. (Later I checked Kurian's negative words and found them to be pretty strong—urine, puke and a few other choice ones.)

Did I want a long session or a short one? I found I was more relaxed by the long session, which seemed to last about five minutes longer than the shortie. The only problem with the long session was that I was at first a little distracted by the whirring of the disk drive.

Kurian directed me to darken my environment and block out the outer world so I could enter my inner world. I was to breathe slowly and deeply as if I were floating. I was to remember a time when I was very relaxed and peaceful.

I envisioned trips to the White Mountains of New Hampshire, sitting next to the Saco River, watching it flow endlessly over the rocks. He asked, "Do you recall most vividly what you were seeing or what you were hearing or feeling? The first time I answered "yes," and he said, "Now answer correctly!" I figured out my error and typed in "seeing," and Kurian assured me that seeing what would follow would relax me and make me feel peaceful.

Next step: I was directed to stare at any point on a picture of an Egyptian woman facing some kind of creature. While I stared, very slow music was played. The basic difference between the long and short session lay in the amount of time I spent staring at this screen.

Now, on to the relaxation session, where I used the biofeedback device. I was asked what my normal pulse is, and I input 78. (If you give too low a number, the computer will keep you in this mode until you get down there. So take your pulse first.)

Next, the biofeedback device gave me readings, and I consciously tried to lower the number flashing on the screen. It goes up and down, and once you've reached or dropped below your goal pulse, you'll be moved on to the next part of the program.

And that's the swinging pendulum we commonly associate with hypnosis—remember the mad doctor swinging his pocket watch back and forth in front of his poor trapped victims? Well, The Hypnotist strobes a purple pendulum back and forth.

At first, it swings monotonously with a heartbeat-like background noise. Then, without any sound, the pendulum swings frantically back and forth, suddenly disappearing. You're ready to be programmed.

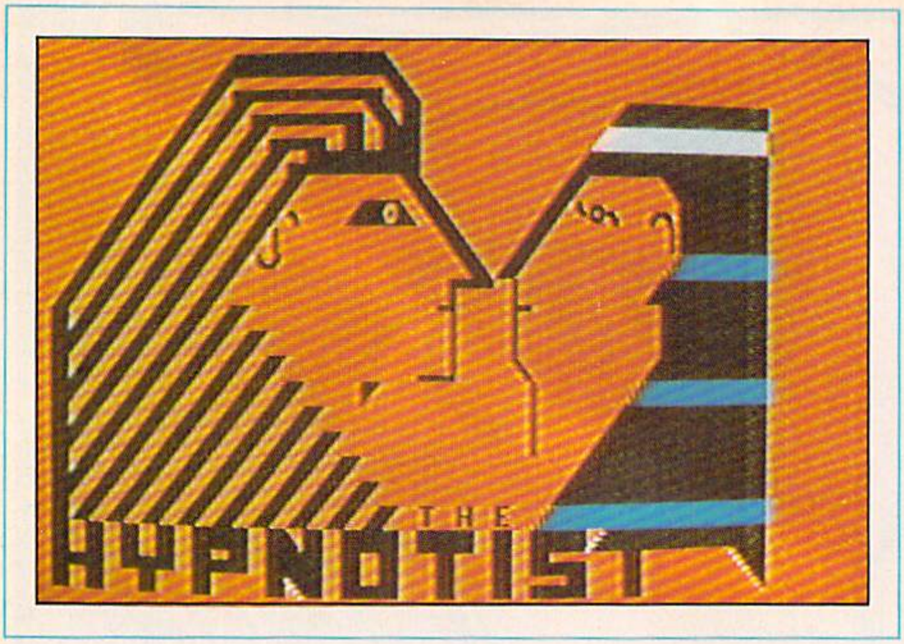
A habit word is paired with one of the stimulus words and they are strobed up and down the screen, followed immediately by another pair. I concentrated intensely as "food control" and "healthy" skimmed madly down my computer screen.

The final step is the wake up—a screaming siren and the words "Wake Up" were scrolled from top to bottom of my screen. The end involved Kurian telling me what a great subject I'd been.

Other Hypnotist Options

If you don't have any bad habits, but would like to lower your stress level, regress or memorize important passages, you could try these other three choices embedded in The Hypnotist.

For example, in the Superlearning mode, if you select the Gettysburg computer file, the Gettysburg Address will



be scrolled down your computer screen, several words at a time. Or you can create your own files containing information or passages that you'd like to remember.

How about the biofeedback stress control? I'm not sure how well it works on a person with a real problem, but it certainly has a lot of potential to help busy executives on the fast track as well as the rest of us in the daily grind. (I'm testing it out on my Program-Manager husband—too soon to report results.)

The Biofeedback mode is centered on the screen, which shows your pulse. And yes, by concentrating and watching the waveform and the flashing numbers of your pulse, you really *can* lower your pulse and make yourself more relaxed. I'm not overly-stressed, but I do wake up once or twice every night, routinely. If I use The Hypnotist before bed, I'm out cold for eight hours and I wake up feeling great. (What a cure for insomnia!)

I haven't yet figured out the regression mode. In this option you're given a lot of printed, very positive feedback and told that problems will be perceived as opportunities for growth and so on. It sounded very Dale Carnegie-ish to me. Then the computer starts drawing weird scribbles on the screen.

According to Patrick Williams, creator of The Hypnotist and president of Psycom, this option uses the drawings somewhat like psychological inkblots; people stare at them to imagine what they look like. Williams calls it "a reverie sort of thing," and it seems to fit what we used to call consciousness-raising.

Do I have any criticisms? I wish I could save my words for the habit modification program. Continuity and consistency would not only eliminate the tedium of having to input them each time, but would also ensure I don't forget the good ones.

Is This for Real?

Was I really hypnotized? It's harder to tell than you think. I remember not believing I had been hypnotized when I went to a living, breathing therapist.

On the drive home I kept chiding myself for wasting good money. But then when I thought it would be nice to have an ice cream cone on the way home, an inner voice told me I didn't need it. And this continued for several days until I quit wanting those between-meal snacks that were keeping me a chubbo. Suddenly I wanted to take long walks, to exercise.

I still can't say for sure that The Hypnotist and my C-64 really hypnotized me, but I am losing weight (four pounds in a week, so far). Nutritious food tastes better than the junk my palate usually adores.

The last time I ran the program and the wake-up mode came on, I was so startled my whole body jerked—as though someone had sneaked up from behind and grabbed me. But don't worry—Williams insists you won't turn into a life-long zombie if the screaming "Wake Up" doesn't bring you back to

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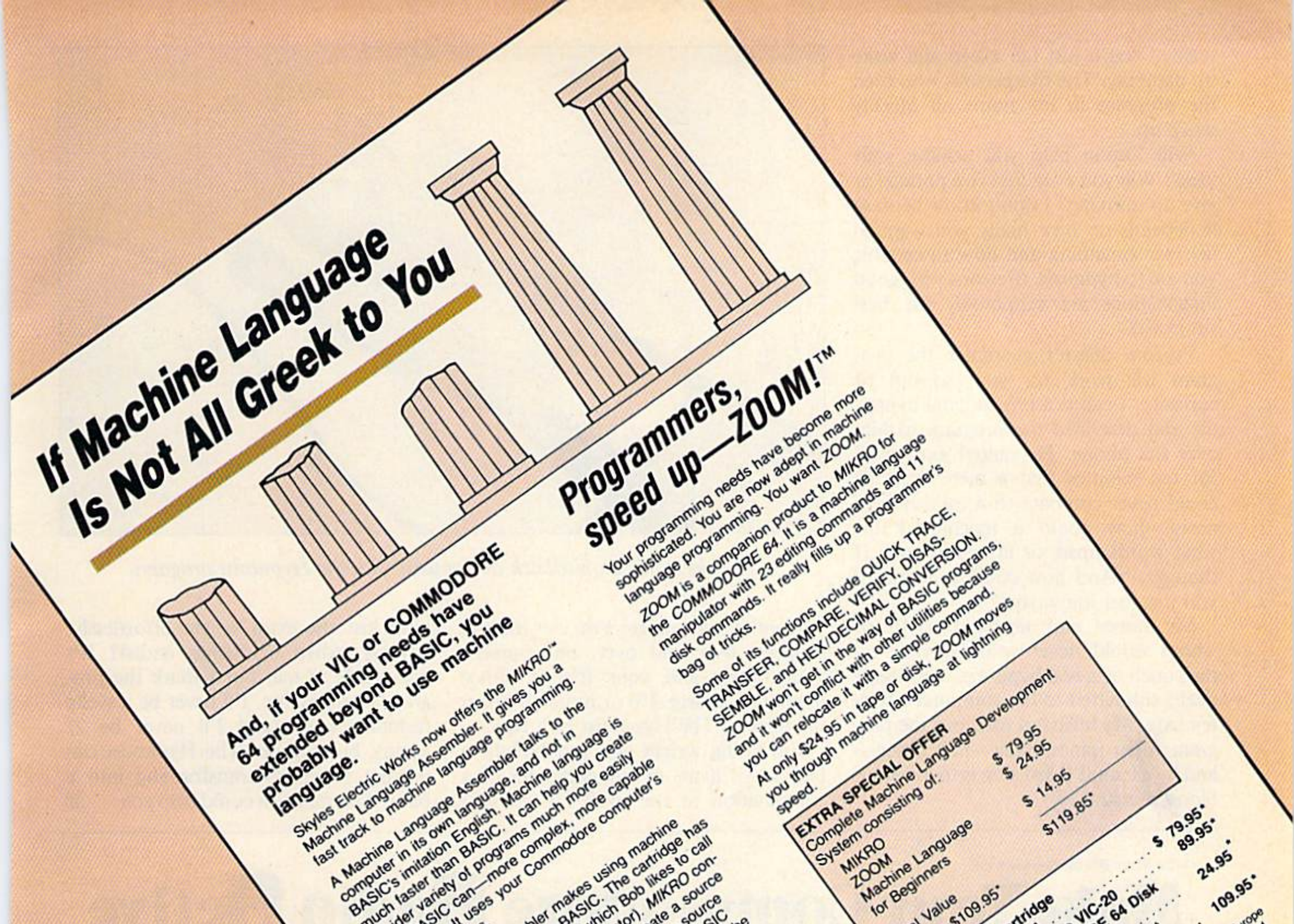

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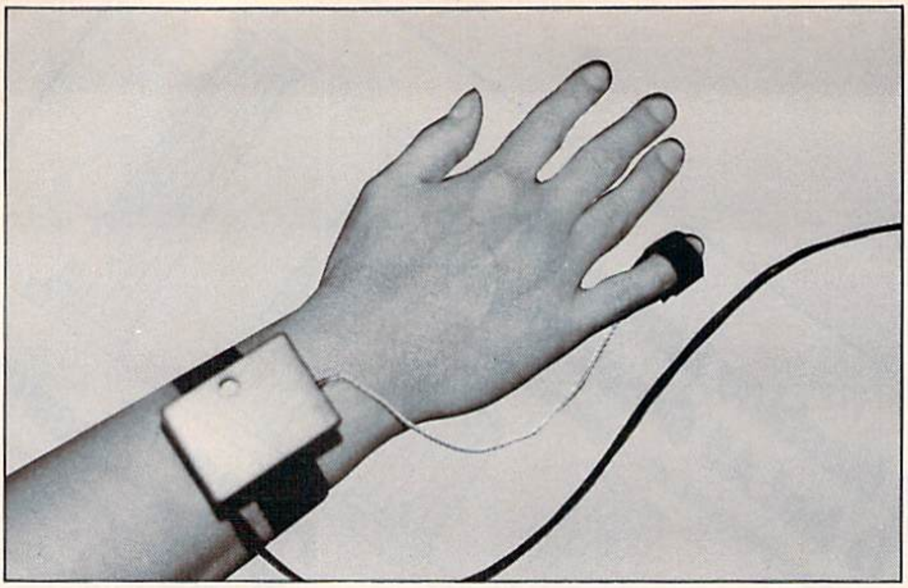
reality. You'd just fall asleep and wake up naturally. The five persons who tried the program in my home all quickly woke up.

Will Kurian help you achieve your ideal? Will you even lose five pounds or give up smoking? I don't know because it depends on how badly you want to achieve something and how susceptible you are to hypnosis. (Persons with good imaginations are supposedly the best subjects.)

Psycom doesn't guarantee the program will work for you, so out of curiosity, I called a professional hypnotist and described the program to him over the phone. He ranted and raved for ten minutes that a mere machine could never compare to a trained hypnotist—how could a machine know what words upset or influence you? (I thought, "And how could a hypnotist you just met know you?")

My father and husband, both of whom would never voluntarily lie on the couch of a real hypnotist, enthusiastically submitted to the computer—they felt safe. My husband tried out the program for a minor habit—nail biting—and he's cured! (Next step is to lower his blood pressure.)



The electronic biofeedback device used with the Hypnotist program.

Another advantage: You can run the program over and over, on yourself, your family and your friends. Since hypnotists charge $50 or more an hour, the price of The Hypnotist isn't bad.

I'm losing weight and just bought a bicycle—is it me or my computer or a combination of the two? Or would I have lost the extra weight effortlessly, anyway, when Christmas ended? It's impossible to tell, but I think the program's helping me. I'll never be a svelte fashion model (and I'll never be 21 again), but perhaps The Hypnotist can prevent me from transforming into a blob. And maybe it could help you.

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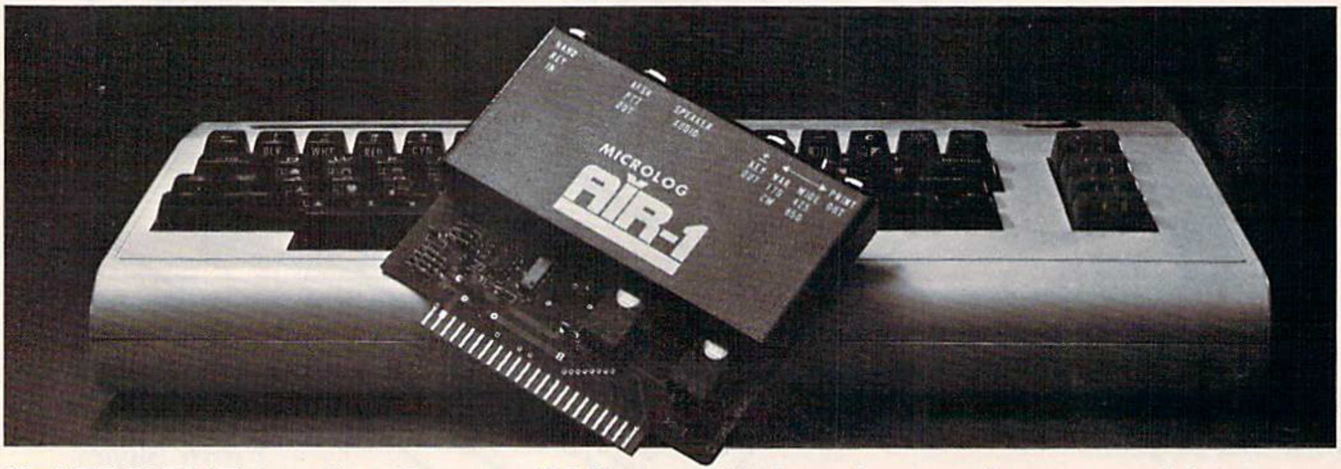

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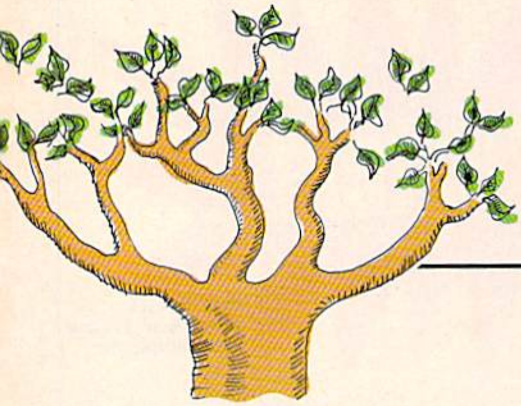
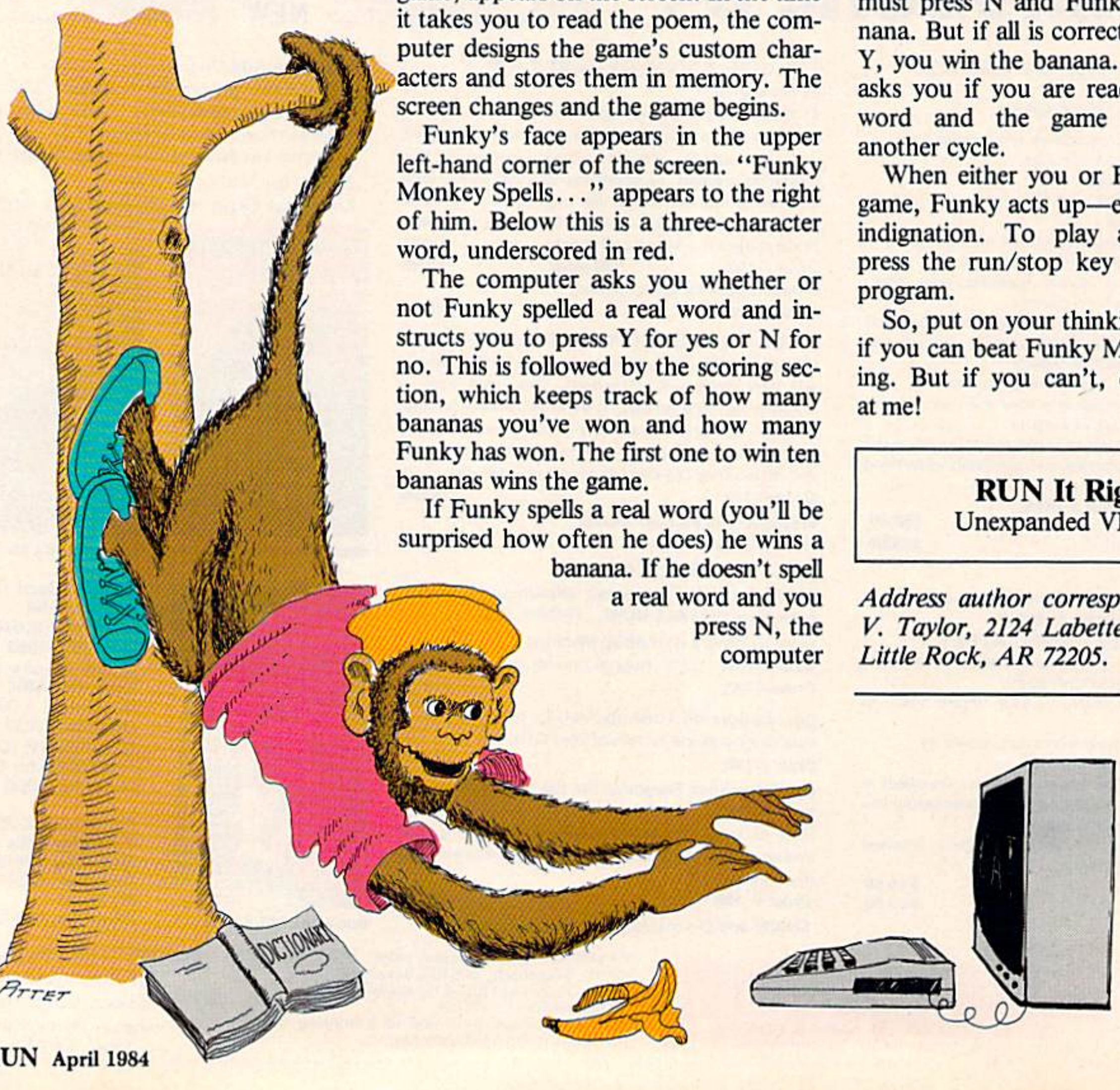


Funky Monkey

This educational program is a great aid in helping young folks sharpen their spelling skills. If *your* spelling skills leave much to be desired, then this program will probably make a monkey out of *you*.

By R. V. Taylor



If you like word games or have children who are learning to spell, then Funky Monkey, written for the unexpanded VIC, is a game that will give you many hours of enjoyment.

Funky Monkey spells a word
Some are ones you've never heard
Beat him spelling if you can
And put bananas in your pan!

After you've loaded the program, this little poem, which explains the game, appears on the screen. In the time it takes you to read the poem, the computer designs the game's custom characters and stores them in memory. The screen changes and the game begins.

Funky's face appears in the upper left-hand corner of the screen. "Funky Monkey Spells..." appears to the right of him. Below this is a three-character word, underscored in red.

The computer asks you whether or not Funky spelled a real word and instructs you to press Y for yes or N for no. This is followed by the scoring section, which keeps track of how many bananas you've won and how many Funky has won. The first one to win ten bananas wins the game.

If Funky spells a real word (you'll be surprised how often he does) he wins a banana. If he doesn't spell a real word and you press N, the computer asks you if you can make a real word out of Funky's three letters.

If you can make a word by rearranging the letters and/or adding other characters, press Y. The computer asks you to type the word and then to press the return key.

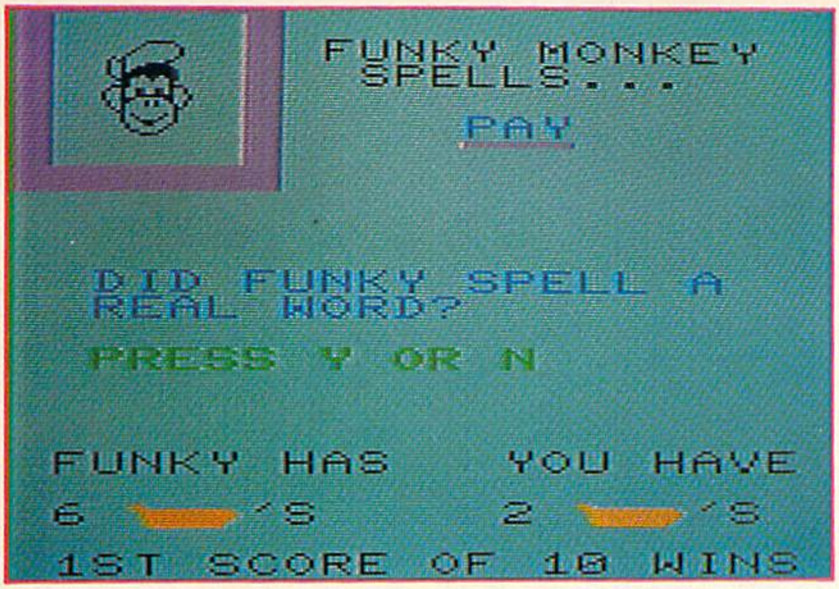
Next, the computer asks you to check your word to see that it is correct—that it contains Funky's initial three letters and that it's a real word. If you made a mistake or if it's not a true word, you must press N and Funky wins the banana. But if all is correct and you press Y, you win the banana. The computer asks you if you are ready for another word and the game goes through another cycle.

When either you or Funky wins the game, Funky acts up—either in glee or indignation. To play another game, press the run/stop key and rerun the program.

So, put on your thinking cap and see if you can beat Funky Monkey in spelling. But if you can't, don't get mad at me! R

RUN It Right
Unexpanded VIC-20

Address author correspondence to R. V. Taylor, 2124 Labette Manor Drive, Little Rock, AR 72205.



```
FUNKY MONKEY
   SPELLS...

      PAY


DID FUNKY SPELL A
REAL WORD?

PRESS Y OR N

FUNKY HAS     YOU HAVE
6    'S       2    'S
1ST SCORE OF 10 WINS
```

Sample screen display of Funky Monkey program.

Listing. Funky Monkey program for the unexpanded VIC-20.

```
10 PRINT""
20 REM: FUNKY MONKEY
30 POKE36869,240
40 PRINTCHR$(147)CHR$(28)TAB(97)"XXXX
50 PRINTCHR$(31)TAB(23)"FUNKY MONKEY SPELLS{5 SPACEs}A
     WORD"
60 PRINTTAB(23)"SOME ARE ONES YOU'VE{4 SPACEs}NEVER HEA
     RD"
70 PRINTTAB(23)"BEAT HIM SPELLING{7 SPACEs}IF YOU CAN"
80 PRINTTAB(23)"AND PUT BANANAS IN{6 SPACEs}YOUR PAN!"
90 PRINTCHR$(28)TAB(31)"XXXX
100 FORT=1TO2000:NEXT
110 POKE52,28:POKE56,28:CLR
120 FORI=7168TO7679:POKEI,PEEK(I+25600):NEXT
130 READA:IFA<0THEN340
140 FORC=ATOA+7:READJ:POKEC,J:NEXT
150 GOTO130
160 DATA7512,0,0,0,0,0,1,10,22
170 DATA7528,0,31,32,64,128,0,0,1
180 DATA7392,0,128,64,32,32,32,64,128
190 DATA7168,18,18,18,19,11,7,3,15
200 DATA7504,31,127,255,255,221,8,0,0
210 DATA7408,0,128,192,192,192,192,128,224
220 DATA7384,18,34,34,35,19,18,10,6
230 DATA7400,102,102,127,129,20,20,0,0
240 DATA7656,144,144,136,136,144,80,96,64
250 DATA7648,2,2,2,1,1,0,0,0
260 DATA7664,129,66,60,24,1,194,60,0
270 DATA7544,64,64,64,128,0,0,0,0
280 DATA7416,255,255,255,255,255,255,255,255
290 DATA7488,255,255,0,0,0,0,0,0
300 DATA7448,32,112,63,31,31,15,15,7
310 DATA7456,0,0,255,255,255,255,255,255
320 DATA7464,0,0,252,254,254,252,248,240
330 DATA-1
340 P=1000:FS=0:YS=0:POKE36869,255
350 PRINTCHR$(147)CHR$(28)"{7 LEFT ARROWs}"
360 FORT=1TO6:PRINT"{LEFT ARROW}"SPC(5)"{LEFT ARROW}":N
     EXT
370 PRINT"{7 LEFT ARROWs}"
380 C$="+-{LB.}{CRSR DN}{3 CRSR LFs}@*{UP ARROW}{CRSR D
     N}{3 CRSR LFs}[]={CRSR DN}{3 CRSR LFs}<>/"
390 PRINTCHR$(19)CHR$(144)TAB(46)C$
```

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Listing continued.

```
400 PRINTCHR$(19)TAB(52)"FUNKY MONKEY
410 FORT=1TOP:NEXT
420 PRINTTAB(9)"SPELLS...":FORT=1TOP:NEXT
430 GOSUB660
440 PRINTCHR$(19)CHR$(31)TAB(122)CHR$(C);
450 GOSUB660
460 IFC=65ORC=69ORC=73ORC=79ORC=85THEN480
470 GOTO450
480 PRINTCHR$(19)TAB(123)CHR$(C);
490 GOSUB660
500 PRINTCHR$(19)TAB(124)CHR$(C)
510 PRINTCHR$(19)CHR$(28)TAB(144)"((("
520 PRINTCHR$(19)CHR$(144)TAB(255)TAB(155);
530 PRINT"FUNKY HAS{3 SPACEs}YOU HAVE"
540 PRINTCHR$(17)FSCHR$(158)"#$%"CHR$(144)"'S";
550 PRINTSPC(4)YSCHR$(158)"#$%"CHR$(144)"'S
560 PRINTCHR$(17)CHR$(144)CHR$(29)"1ST SCORE OF 10 WINS
    ";
570 PRINTCHR$(145)
580 PRINTCHR$(19)CHR$(31)TAB(244);
590 PRINT"DID FUNKY SPELL A{5 SPACEs}REAL WORD?"
600 PRINTTAB(24)CHR$(30)"PRESS Y OR N"
610 GETG$:IFG$=""THEN610
620 IFG$="N"THEN680
630 IFG$="Y"THEN740:GOTO610
640 GETG$:IFG$=""THEN640
650 GOTO430
660 C=INT(RND(.)*26)+65:RETURN
670 FORT=1TOP:NEXT:RETURN
680 GOSUB870
690 PRINTCHR$(19)CHR$(31)TAB(243);
700 PRINT"CAN YOU MAKE A REAL{3 SPACEs}WORD OUT OF FUNK
    Y'S?
710 GETG$:IFG$=""THEN710
720 IFG$<>"Y"ANDG$<>"N"THEN710
730 IFG$="Y"THEN880
740 GOSUB870
750 FS=FS+1:PRINTTAB(198)CHR$(144)FS
760 IFFS=10THEN1070
770 PRINTCHR$(19)CHR$(31)TAB(244);
780 PRINT"THEN FUNKY GETS A{5 SPACEs}BANANA!"
790 P=2000:GOSUB670
800 GOSUB870
810 PRINTCHR$(19)CHR$(31)TAB(244);
820 PRINT"ARE YOU READY FOR{5 SPACEs}ANOTHER WORD?"
830 GETG$:IFG$=""THEN830
840 IFG$<>"N"ANDG$<>"Y"THEN830
850 IFG$="N"THEN830
860 IFG$="Y"THENP=500:GOTO350
870 PRINTCHR$(19)TAB(242);:FORI=1TO44:PRINT"{SPACE}";:N
    EXT:RETURN
880 GOSUB870
890 PRINTCHR$(19)CHR$(30)TAB(248)TAB(68)"PRESS RETURN
900 PRINTCHR$(19)CHR$(31)TAB(244)
910 INPUT"TYPE WORD";A$
920 GOSUB870
930 PRINTCHR$(19)TAB(244)TAB(68)CHR$(30)"PRESS Y OR N
940 PRINTCHR$(19)CHR$(31)TAB(244)"IS "A$" RIGHT?
950 GETG$:IFG$=""THEN950
960 IFG$<>"Y"ANDG$<>"N"THEN950
970 IFG$="N"THEN740
980 GOSUB870
990 YS=YS+1:PRINTTAB(210)CHR$(144)YS
1000 GOSUB870
1010 IFYS=10THEN1050
1020 PRINTCHR$(19)CHR$(31)TAB(244)"YOU GET A BANANA!
1030 P=2000:GOSUB670
1040 GOTO800
1050 PRINTCHR$(19)CHR$(31)TAB(248)"YOU WIN!
1060 GOTO1100
1070 GOSUB870
1080 PRINTCHR$(19)CHR$(31)TAB(246)"FUNKY WINS!"
1090 GOTO1100
1100 PRINTCHR$(144):FORJ=1TO12
1110 PRINTCHR$(19)TAB(46)"{3 SPACEs}"TAB(24)"{3 SPACEs}
     "TAB(24)"{3 SPACEs}";
1120 PRINTTAB(24)"{3 SPACEs}"TAB(24)"{3 SPACEs}"
1130 PRINTCHR$(19)TAB(24)C$:FORT=1TO150:NEXT
1140 PRINTCHR$(19)TAB(24)"{3 SPACEs}"TAB(24)"{3 SPACEs}
     ";
1150 PRINTCHR$(19)TAB(24)"{3 SPACEs}"TAB(24)"{3 SPACEs}
     "
1160 PRINTCHR$(19)TAB(46)C$:FORT=1TO150:NEXT:NEXT
1170 GOTO1170
```

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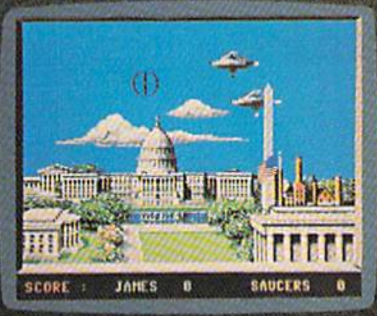

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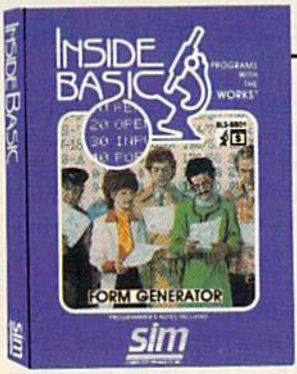

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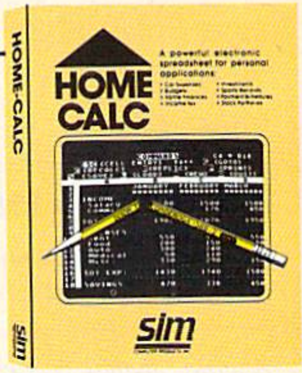

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11
12
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5

This timely program teaches children how to tell time. The object in this cute educational game is to stop the hands of the clock to match the time printed on the screen.

RUN It Right

Unexpanded VIC-20
Commodore 64

Address author correspondence to Dennis G. Smith, 255 Highfield Road, Marshall, MI 49068.

Teachers or parents can use this program to teach children how to tell time. It is presented in the form of a game; the child wins if he can stop the clock's hands at the correct time *three* times. The program was written for the unexpanded VIC; the Commodore 64 version is also included.

The program begins with a time diagram of a clock that shows how the hour numerals correspond to five-minute intervals. This diagram will flash to the screen for reference if the child misses three consecutive times.

Also, this screen asks if the child wishes directions. If no directions are needed, random times will be generated under the same difficulty option as previously chosen. If the child initially bypasses directions and difficulty selection, then the simplest difficulty option is automatically exercised.

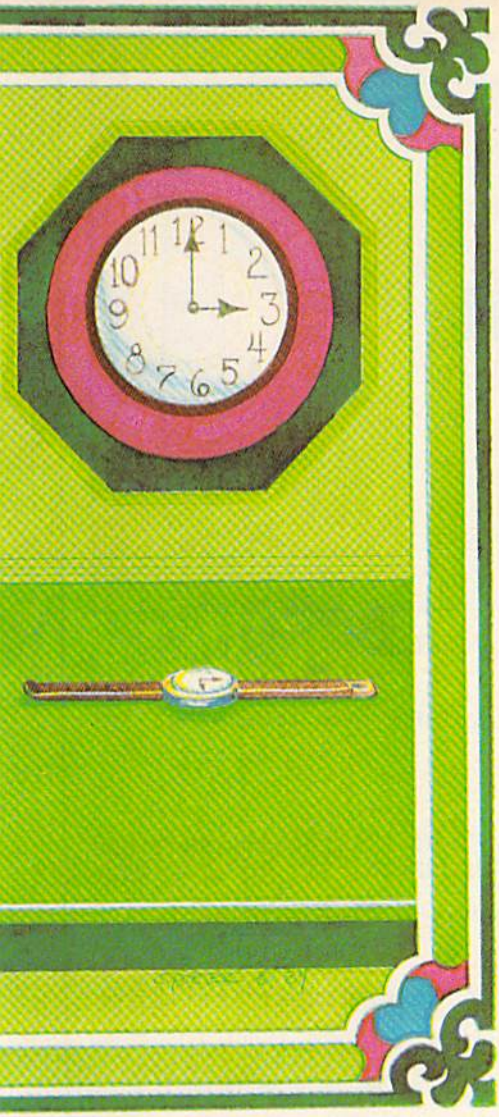
The directions are simple: Try to stop the clock when the hands match the printed time. You win with three right. The clock's hands move, tick-tock around the clock, automatically. They can be hurried along by using two of the special function keys: the f1 key moves the hour hand faster, and the f3 key moves the minute hand faster. This enables the child to get the hands in approximate position without having to wait.

To best operate the function keys, the child should press the key once after each tick-tock. This prevents unexpected hand jumps.

Moving the hour hand to the hour before the posted time is another hint that works well. The minute hand can then be used to get even closer.

I suggest letting the clock tick-tock automatically into final position. The f7 is shown as the key for starting and stopping the clock. Actually, however, the f5 or any other regular key will work as well.

Each time the clock screen appears, a randomly generated time is printed in the upper corner. There are three levels of difficulty. Level one only generates on-the-hour times (1:00, 2:00, 3:00, etc.). Half-hour times are included in



Time Waits for No Man (or Child)

By Dennis G. Smith

level two (4:30, 5:30, 6:30, etc.). Level three prints times chosen as five-minute multiples after the hour (7:35, 8:15, 9:10, etc).

When the clock is stopped, the program evaluates the correspondence between the hand positions and the printed time. If the relationship is correct, then the clock alarm rings and "yes" is printed along with the number correct, so far. When three correct is achieved, a siren sounds, and the child can change difficulty levels or quit the program.

The Commodore 64 version is a little longer, but the program format is identical (screen and sound functions require more Pokes).

I hope this program will provide as enjoyable a learning experience for other kids as it has for my own daughters. If you want the program, but do not wish to type it, send me your name, address and $5 (to cover the tape cost, postage and my trouble), and I will send you a cassette of whichever version you request. ®

Listing 1. Stop the Clock program for the VIC-20.

```
0 REM STOP THE CLOCK
1 L$="782678497915800380248020801779947906784078197822"
```

```
2 LH$="782778717981802580238018801679727862781878207825
    "
3 IH$="+2178+2178-2377-2377-2377-2178-2178-2178+2377+23
    77+2377+2178"
4 IP$="+2178+2178-0164-2377-2377-2266-2178-2178+0167+23
    77+2377+2266"
5 B$="777877847807791780498070806480598036790477947773"

6 CO=30720:V=36878:S1=36874:S2=36875:S3=36876:SC=36879:
    POKEV,15
10 POKESC,174:PRINT"{SHFT CLR}{5 CRSR RTs}{CTRL 9}TIME
    DIAGRAM{CTRL 0}":PRINT"{CRSR DN}";SPC(8);"00":PRIN
    T"{6 SPACEs}{5 COMD @s} 5"
15 PRINT"{3 SPACEs}55{SHFT N}{2 SPACEs}12{SPACE}{SHFT M
    }":PRINT"{4 SPACEs}{SHFT N}11{3 SPACEs}1{SPACE}{SH
    FT M}{SPACE}10" : PRINT" 50{SHFT N}{9 SPACEs}{SHFT
     M}"
20 PRINT"{2 SPACEs}{COMD M}10 CLOCK 2 {COMD G}":PRINT"{
    2 SPACEs}{COMD M}";SPC(11);"{COMD G}"
25 PRINT"45{COMD M}9{2 SPACEs}{SHFT Q}{SHFT *}{COMD +}{
    4 SPACEs}3{COMD G}15":PRINT"{2 SPACEs}{COMD M}{5 S
    PACEs}{SHFT -}{5 SPACEs}{COMD G}"
30 PRINT"{2 SPACEs}{COMD M} 8{3 SPACEs}{SHFT -}{3 SPACE
    s}4 {COMD G}":PRINT"{SPACE}40{SHFT M}{4 SPACEs}{SH
    FT -}{4 SPACEs}{SHFT N}20"
35 PRINT"{4 SPACEs}{SHFT M} 7 {SHFT Q} 5 {SHFT N}":PRIN
    T"{3 SPACEs}35{SHFT M}{2 SPACEs}6{2 SPACEs}{SHFT N
    }25"
40 PRINT"{6 SPACEs}{5 COMD Ts}":PRINTTAB(7)"30"
45 PRINT"{CRSR DN}{4 SPACEs}TIME= 9:30"
```

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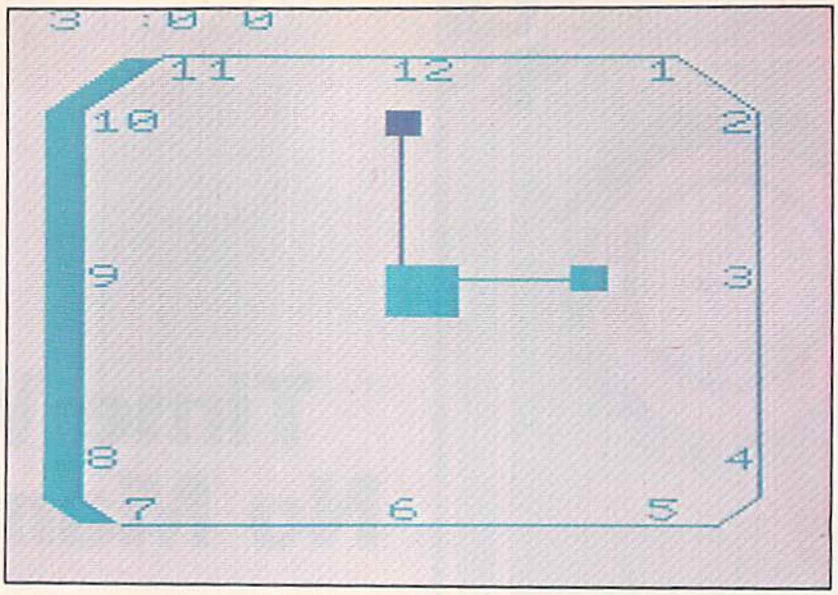

Screen display of clockface.

Listing 1 continued.

```
50 PRINT"{CRSR DN} PRESS 'F7',START GAME";:PRINT"OR 'D'
     ,DIRECTIONS."
55 GETS$:IFS$=""THEN55
56 IFS$="D"THEN58
57 GOTO200
58 PRINT"{SHFT CLR}{4 SPACEs}{CTRL 9}{CTRL 3}DIRECTIONS
     {CTRL 0}{CTRL 7}":PRINT"{CRSR DN} TRY TO STOP THE
     CLOCK";
65 PRINT"WHEN THE HANDS MATCH":PRINT"THE PRINTED TIME."

70 PRINT" YOU WIN WITH 3 RIGHT."
75 PRINT"{CTRL 9}CONTROL KEYS{CTRL 0}":PRINT"'F1' MOVES
      LITTLE HAND";
80 PRINT"'F3' MOVES BIG HAND"
85 PRINT"'F7' STOPS CLOCK"
87 PRINT"{3 CRSR DNs} (PRESS ANY KEY.)"
90 GETS$:IFS$=""THEN90
150 PRINT"{SHFT CLR}{CRSR DN}{CTRL 9}PROBLEM DIFFICULTY
     {CTRL 0}"
155 PRINT"{CRSR DN}(1) HOUR{2 CRSR DNs}(2) HOURS & 1/2-
     HOURS"
160 PRINT"{CRSR DN}(3) 5-MIN. INTERVALS"
165 PRINT"{2 CRSR DNs}  PRESS 1,2,OR 3.":PRINT"{CRSR DN
     }  PRESS 'Q' TO QUIT."
170 GETD$:IFD$=""THEN170
173 IFD$="Q"THENPOKEV,0:POKESC,27:PRINT"{SHFT CLR}":END

175 D=VAL(D$)
180 IFD>3ORD<1THEN170
200 PRINT"{SHFT CLR}":R=0:W=0:POKESC,159
210 PRINT"{4 CRSR RTs}{14 COMD @s}"
211 PRINT"{2 CRSR RTs}{CTRL 9}{SHFT LB.}{CTRL 0}{SHFT L
     B.}11{4 CRSR RTs}12{5 CRSR RTs}1{SHFT M}"
212 PRINT"{CRSR RT}{CTRL 9}{SHFT LB.}{CTRL 0}{SHFT LB.}
     ";SPC(16);"{SHFT M}"
213 PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}10";SPC(15);"
     2{COMD G}"
214 PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}";SPC(18);"{C
    OMD G}":PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}";SP
    C(18);"{COMD G}":PRINT"{CRSR RT}{CTRL 9}{SPACE}{CT
    RL 0}";SPC(18);"{COMD G}"
215 PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}";SPC(18);"{C
    OMD G}":PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}"SPC
    (18);"{COMD G}"
216 PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}9{7 CRSR RTs}
    {CTRL 9}{2 SPACEs}{CTRL 0}{7 CRSR RTs}3{COMD G}"
```

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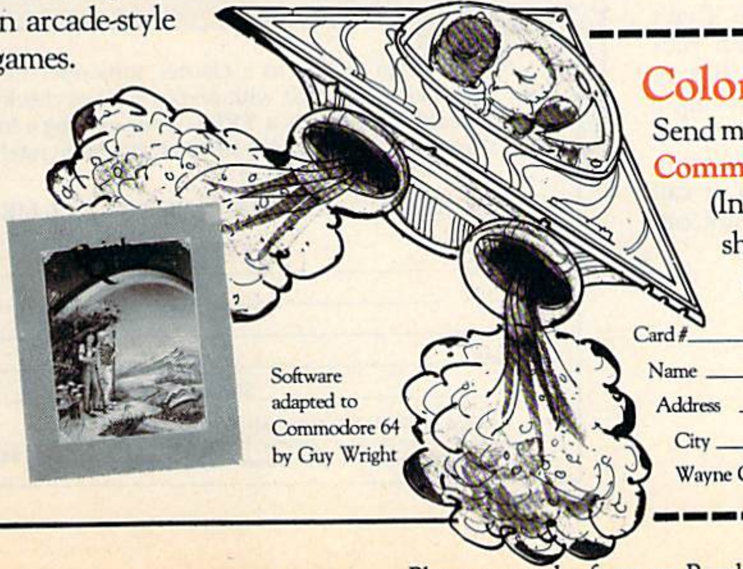

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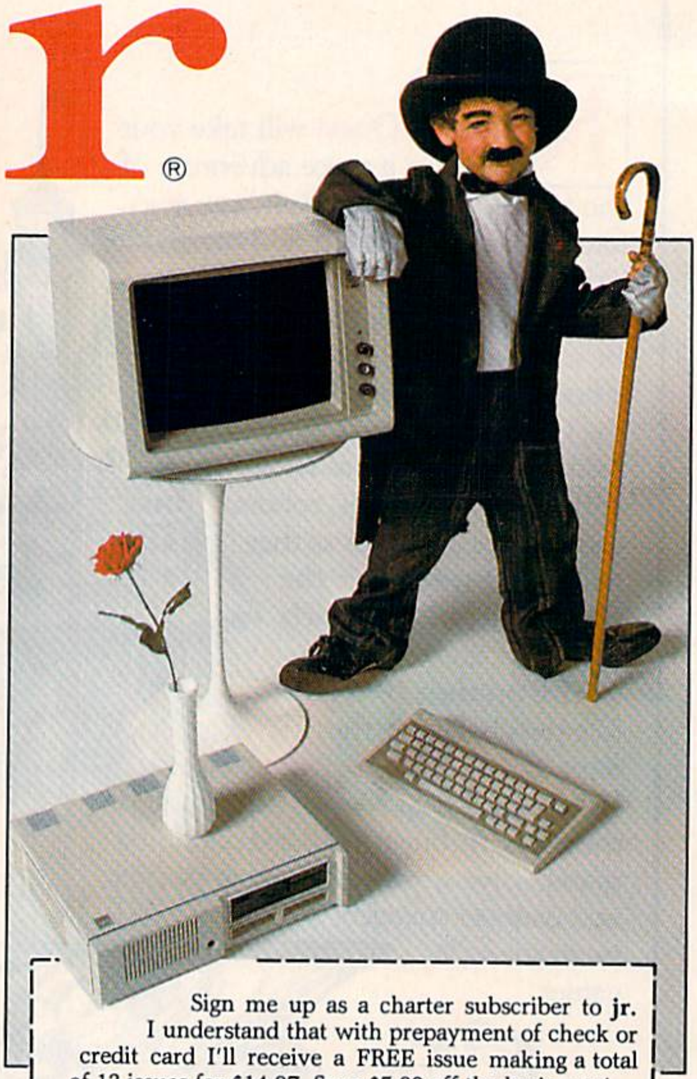

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Listing 1 continued.

```
217 PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}{8 CRSR RTs}{
     CTRL 9}{2 SPACEs}{CTRL 0}{8 CRSR RTs}{COMD G}"
218 PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}";SPC(18);"{C
     OMD G}":PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}";SP
     C(18);"{COMD G}":PRINT"{CRSR RT}{CTRL 9}{SPACE}{CT
     RL 0}";SPC(18);"{COMD G}"
219 PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}";SPC(18);"{C
     OMD G}":PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}";SP
     C(18);"{COMD G}"
220 PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}8";SPC(16);"4
     {COMD G}":PRINT"{CRSR RT}{CTRL 9}{SPACE}{CTRL 0}";
     SPC(18);"{COMD G}"
221 PRINT"{CRSR RT}{COMD *}{CTRL 9}{COMD *}{CTRL 0}7{6
     CRSR RTs}6{6 CRSR RTs}5{CRSR RT}{SHFT N}": PRINT"{
     3 CRSR RTs}{16 COMD Ts}"
240 HR=INT(RND(1)*12+1):Q=0
242 IFD=3THENMN=INT(RND(1)*12):GOTO248
243 IFD=2THENMN=6*INT(RND(1)*2):GOTO248
247 MN=0
248 IFMN=0ORMN=1THENPRINT"{HOME}";HR;":0";5*MN:GOTO250
249 PRINT"{HOME}";HR;":";5*MN
250 H=1 :RM=0
251 IFRM>2THENPL=VAL(MID$(LH$,(H-1)*4+1,4)):GOTO280
270 PL=VAL(MID$(L$,(H-1)*4+1,4))
280 PB=VAL(MID$(B$,4*RM+1,4))
284 IFRM=0THENII=22:PP=66:GOTO290
285 II=VAL(MID$(IP$,(RM-1)*5+1,3))
286 PP=VAL(MID$(IP$,(RM-1)*5+4,2))
290 POKEPB,160:POKEPB+CO,0
300 FORK=1TO5:POKEPB+K*II,PP:POKEPB+K*II+CO,0:NEXTK
305 POKES1,240:FORK=1TO10:NEXTK:POKES1,0
310 IFRM>2THENI=VAL(MID$(IH$,(H-1)*5+1,3)):P=VAL(MID$(I
     H$,(H-1)*5+4,2)):GOTO330
320 I=VAL(MID$(IP$,(H-1)*5+1,3)):P=VAL(MID$(IP$,(H-1)*5
     +4,2))
330 POKEPL,160:POKEPL+CO,6
340 FORK=1TO3:POKEPL+K*I,P:POKEPL+K*I+CO,6:NEXTK
350 FORK=1TO600:NEXTK
353 IFQ2=1THEN650
355 GETS$:IFS$=""THEN379
357 IFS$="{FUNCT 1}"THENRM=RM+12:GOTO379
358 IFS$="{FUNCT 3}"THENRM=RM+2:GOTO379
359 IFHR=HANDMN=RMTHEN500
360 GOTO600
379 POKES2,240:FORK=1TO10:NEXTK:POKES2,0
380 POKEPB,32:FORK=1TO5:POKEPB+K*II,32:NEXTK
381 POKEPL,32:FORK=1TO3:POKEPL+K*I,32:NEXTK
385 IFQ=1THEN240
386 IFQ2=1THEN251
390 RM=RM+1
391 IFRM>11THENH=H+1:RM=0
392 IFH>12THEN250
400 GOTO251
500 FORK=1TO2:PRINT"{HOME}"SPC(14);"YES"
501 FORJ=1TO15:FORX=1TO10:POKES3,230:NEXTX:POKES3,0:NEX
     TJ
502 PRINT"{HOME}";SPC(14);"{4 SPACEs}":POKES3,0:FORX=1T
     O200:NEXTX:NEXTK
503 R=R+1:W=0:PRINT"{HOME}";SPC(20);R
504 IFR=3THENPRINT"{HOME}FANTASTIC !{7 SPACEs}":FORX=1T
     O50:POKES3,190+X:NEXTX:POKES3,0:GOTO700
505 PRINT"{HOME}PUSH 'F7' TO START."
506 GETS$:IFS$=""THEN506
510 PRINT"{HOME}{19 SPACEs}":Q=1:GOTO380
600 POKES1,190:FORX=1TO400:NEXTX:POKES1,0:Q2=1:RM=MN:H=
     HR:W=W+1
603 GOTO380
650 PRINT"{HOME}";SPC(9);"CORRECTED":Q2=0
652 FORX=1TO2000:NEXTX
653 IFW>2THEN10
654 PRINT"{HOME}PUSH 'F7' TO START.  "
655 GETS$:IFS$=""THEN655
657 PRINT"{HOME}{19 SPACEs}"
660 Q=1:GOTO380
700 FORX=1TO1000:NEXTX
701 GOTO150
```

Listing 2. Stop the clock program for the C-64.

```
0 REM STOP THE CLOCK-C64
1 L$="13271409152916891767176317601678151813981320132 3"
```

```
0 REM STOP THE CLOCK-C64
1 L$="132714091529168917671763176016781518139813201323"

2 LH$="1329144916491769176617611758163814381318132113 26
     "
3 IH$="+3978+3978-4177-4177-4177-3978-3978-3978+4177+41
     77+4177+3978"
4 IP$="+3978+3978-0164-4177-4177-4066-3978-3978+0167+41
     77+4177+4066"
5 B$="124312491331153117711849184318381756151613161238"
     :S2=54285
6 CO=54272:V=54296:SC=53281:BO=53280:W2=54283:A2=54284:
     H2=54280:L2=54279
8 FORX=54272TO54296:POKEX,0:NEXTX:POKEV,15:POKEA2,116:P
     OKES2,128
10 POKESC,12:POKEBO,3
11 PRINT"{SHFT CLR}{5 CRSR RTs}{COMD 4}{CTRL 9} TIME DI
     AGRAM {CTRL 0}":PRINT"{CRSR DN}";SPC(8);"00":PRINT
     "{6 SPACEs}{5 COMD @s} 5"
```

More

Listing 2 continued.

```
15 PRINT"{3 SPACEs}55{SHFT N}  12 {SHFT M}":PRINT"{4 SP
     ACEs}{SHFT N}11{3 SPACEs}1 {SHFT M} 10":PRINT" 50{
     SHFT N}{9 SPACEs}{SHFT M}"
20 PRINT"{2 SPACEs}{COMD M}10 CLOCK 2 {COMD G}":PRINT"{
     2 SPACEs}{COMD M}";SPC(11);"{COMD G}"
25 PRINT"45{COMD M}9{2 SPACEs}{SHFT Q}{SHFT *}{COMD +}{
     4 SPACEs}3{COMD G}15":PRINT"{2 SPACEs}{COMD M}{5 S
     PACEs}{SHFT -}{5 SPACEs}{COMD G}"
30 PRINT"{2 SPACEs}{COMD M} 8{3 SPACEs}{SHFT -}{3 SPACE
     s}4 {COMD G}":PRINT" 40{SHFT M}{4 SPACEs}{SHFT -}{
     4 SPACEs}{SHFT N}20"
35 PRINT"{4 SPACEs}{SHFT M} 7 {SHFT Q} 5 {SHFT N}":PRIN
     T"{3 SPACEs}35{SHFT M}  6  {SHFT N}25"
40 PRINT"{6 SPACEs}{5 COMD Ts}":PRINTTAB(7)"30"
45 PRINT"{CRSR DN}    TIME= 9:30"
50 PRINT"{2 CRSR DNs} PRESS 'F7' TO START GAME ,OR PRES
     S":PRINT" 'D' FOR DIRECTIONS."
55 GETS$:IFS$=""THEN55
56 IFS$="D"THEN58
57 GOTO200
58 PRINT"{SHFT CLR}";SPC(11);"{CTRL 9} DIRECTIONS {CTRL
      0}"
65 PRINT"{CRSR DN} TRY TO STOP THE CLOCK WHEN THE HANDS
     ":PRINT"MATCH THE PRINTED TIME."
70 PRINT"{CRSR DN} YOU WIN WITH 3 RIGHT."
75 PRINT"{2 CRSR DNs}{CTRL 9} CONTROL KEYS {CTRL 0}":PR
     INT"{CRSR DN}'F1' MOVES THE LITTLE  HAND."
80 PRINT"{CRSR DN}'F3' MOVES THE BIG HAND."
85 PRINT"{CRSR DN}'F7' STOPS CLOCK."
87 PRINT"{3 CRSR DNs} (PRESS ANY KEY.)"
90 GETS$:IFS$=""THEN90
150 POKESC,11:POKEBO,7:PRINT"{SHFT CLR}{CTRL 2}{CRSR DN
     }{CTRL 9}PROBLEM DIFFICULTY{CTRL 0}"
155 PRINT"{CRSR DN}(1) HOUR{2 CRSR DNs}(2) HOURS & 1/2-
     HOURS"
160 PRINT"{CRSR DN}(3) 5-MIN. INTERVALS"
165 PRINT"{6 CRSR DNs}  PRESS 1,2,OR 3":PRINT"{CRSR DN}
      O{2 CRSR DNs}  PRESS 'Q' TO QUIT."
170 GETD$:IFD$=""THEN170
173 IFD$="Q"THENPOKEV,0:POKESC,6:POKEBO,14:PRINT"{SHFT
     CLR}{COMD 7}":END
175 D=VAL(D$)
180 IFD>3ORD<1THEN170
200 PRINT"{SHFT CLR}{CTRL 3}":R=0:W=0:POKESC,8:POKEBO,2
210 PRINTTAB(12)"{15 COMD @s}":PRINTTAB(10)"{CTRL 9}{SH
     FT LB.}{CTRL 0}{SHFT LB.}";SPC(15);"{SHFT M}"
211 PRINTTAB(9)"{CTRL 9}{SHFT LB.}{CTRL 0}{SHFT LB.} 11
     {5 SPACEs}12{6 SPACEs}1{SHFT M}":PRINTTAB(8)"{CTRL
      9}{SHFT LB.}{CTRL 0}{SHFT LB.}";SPC(19);"{SHFT M}
     "
212 PRINTTAB(8)"{CTRL 9}{SPACE}{CTRL 0}10";SPC(18);"2{S
     HFT M}":PRINTTAB(8)"{CTRL 9} {CTRL 0}";SPC(22);"{C
     OMD G}"
213 PRINTTAB(8)"{CTRL 9}{SPACE}{CTRL 0}";SPC(22);"{COMD
      G}":PRINTTAB(8)"{CTRL 9} {CTRL 0}";SPC(22);"{COMD
      G}"
214 PRINTTAB(8)"{CTRL 9}{SPACE}{CTRL 0}";SPC(22);"{COMD
      G}":PRINTTAB(8)"{CTRL 9} {CTRL 0}";SPC(22);"{COMD
      G}"
215 PRINTTAB(8)"{CTRL 9}{SPACE}{CTRL 0}";SPC(9);"{CTRL
     9}{4 SPACEs}{CTRL 0}";SPC(9);"{COMD G}"
216 PRINTTAB(8)"{CTRL 9}{SPACE}{CTRL 0} 9";SPC(7);"{CTR
     L 9}{4 SPACEs}{CTRL 0}";SPC(7);"3 {COMD G}"
217 PRINTTAB(8)"{CTRL 9}{SPACE}{CTRL 0}";SPC(9);"{CTRL
     9}{4 SPACEs}{CTRL 0}";SPC(9);"{COMD G}"
218 PRINTTAB(8)"{CTRL 9}{SPACE}{CTRL 0}";SPC(9);"{CTRL
     9}{4 SPACEs}{CTRL 0}";SPC(9);"{COMD G}"
219 PRINTTAB(8)"{CTRL 9}{SPACE}{CTRL 0}";SPC(22);"{COMD
      G}":PRINTTAB(8)"{CTRL 9} {CTRL 0}";SPC(22);"{COMD
      G}"
220 PRINTTAB(8)"{CTRL 9}{SPACE}{CTRL 0}";SPC(22);"{COMD
      G}":PRINTTAB(8)"{CTRL 9} {CTRL 0}";SPC(22);"{COMD
      G}"
221 PRINTTAB(8)"{CTRL 9}{SPACE}{CTRL 0}";SPC(22);"{COMD
      G}":PRINTTAB(8)"{COMD *}{CTRL 9}{COMD *}{CTRL 0}8
     ";SPC(18);"4{SHFT N}"
222 PRINTTAB(9)"{COMD *}{CTRL 9}{COMD *}{CTRL 0}";SPC(1
     8);"{SHFT N}":PRINTTAB(10)"{COMD *}{CTRL 9}{COMD *
     }{CTRL 0}7";SPC(6);"6";SPC(7);"5{SHFT N}"
223 PRINTTAB(11)"{COMD *}{CTRL 9}{COMD *}{CTRL 0}{14 CO
     MD @s}{SHFT N}"
240 HR=INT(RND(1)*12+1):Q=0
242 IFD=3THENMN=INT(RND(1)*12):GOTO248
243 IFD=2THENMN=6*INT(RND(1)*2):GOTO248
247 MN=0
248 IFMN=0ORMN=1THENPRINT"{HOME}";HR;":0";5*MN:GOTO250
249 PRINT"{HOME}";HR;":";5*MN
250 H=1 :RM=0
251 IFRM>2THENPL=VAL(MID$(LH$,(H-1)*4+1,4)):GOTO280
270 PL=VAL(MID$(L$,(H-1)*4+1,4))
280 PB=VAL(MID$(B$,4*RM+1,4))
284 IFRM=0THENII=40:PP=66:GOTO290
285 II=VAL(MID$(IP$,(RM-1)*5+1,3))
286 PP=VAL(MID$(IP$,(RM-1)*5+4,2))
290 POKEPB,160:POKEPB+CO,0
300 FORK=1TO5:POKEPB+K*II,PP:POKEPB+K*II+CO,0:NEXTK
305 POKEH2,30:POKEL2,141:POKEW2,17:FORK=1TO10:NEXTK:POK
     EW2,0
310 IFRM>2THENI=VAL(MID$(IH$,(H-1)*5+1,3)):P=VAL(MID$(I
     H$,(H-1)*5+4,2)):GOTO330
```

More

Listing 2 continued.

```
320 I=VAL(MID$(IP$,(H-1)*5+1,3)):P=VAL(MID$(IP$,(H-1)*5
     +4,2))
330 POKEPL,160:POKEPL+CO,6
340 FORK=1TO3:POKEPL+K*I,P:POKEPL+K*I+CO,6:NEXTK
350 FORK=1TO600:NEXTK
353 IFQ2=1THEN650
355 GETS$:IFS$=""THEN379
357 IFS$="{FUNCT 1}"THENRM=RM+12:GOTO379
358 IFS$="{FUNCT 3}"THENRM=RM+2:GOTO379
359 IFHR=HANDMN=RMTHEN500
360 GOTO600
379 POKEH2,61:POKEL2,126:POKEW2,17:FORK=1TO10:NEXTK:POK
     EW2,0
380 POKEPB,32:FORK=1TO5:POKEPB+K*II,32:NEXTK
381 POKEPL,32:FORK=1TO3:POKEPL+K*I,32:NEXTK
385 IFQ=1THEN240
386 IFQ2=1THEN251
390 RM=RM+1
391 IFRM>11THENH=H+1:RM=0
392 IFH>12THEN250
400 GOTO251
500 FORK=1TO2:PRINT"{HOME}"SPC(20);"YES"
501 FORX=1TO10:POKEH2,108:POKEL2,223:POKEW2,17:FORJ=1TO
     10:NEXTJ
502 POKEW2,0:NEXTX
503 PRINT"{HOME}";SPC(20);"{4 SPACEs}":FORX=1TO100:NEXT
     X:NEXTK
504 R=R+1:W=0:PRINT"{HOME}";SPC(37);R
505 IFR=3THENPRINT"{HOME}  {CTRL 9}FANTASTIC{CTRL 0}{10
      SPACEs}":GOTO507
506 PRINT"{HOME}PUSH 'F7' TO START.":GOTO509
507 FORX=1TO75:POKEW2,33:POKEH2,X:POKEL2,100+2*X:FORJ=1
     TO10:NEXTJ:NEXTX
508 POKEW2,0:GOTO700
509 GETS$:IFS$=""THEN509
510 PRINT"{HOME}{19 SPACEs}":Q=1:GOTO380
600 POKEH2,8:POKEL2,23:POKEW2,33:FORX=1TO900:NEXTX:POKE
     W2,0
601 Q2=1:RM=MN:H=HR:W=W+1
603 GOTO380
650 PRINT"{HOME}";SPC(9);"CORRECTED":Q2=0
652 FORX=1TO2000:NEXTX
653 IFW>2THEN10
654 PRINT"{HOME}PUSH 'F7' TO START.{2 SPACEs}"
655 GETS$:IFS$=""THEN655
657 PRINT"{HOME}{19 SPACEs}"
660 Q=1:GOTO380
700 FORX=1TO1000:NEXTX
701 GOTO150
```

Circle 156 on Reader Service card.

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Program of the Month—
Disk Editor 64

You don't need divine intervention to resurrect murdered files. All you need is this full-screen track and sector disk editor for the C-64 and 1541 disk drive.

By Christopher Lampton

It was one of those moments when I wanted to pitch the computer out of my apartment window for the sheer joy of seeing it break into tiny plastic pebbles on the pavement two floors below. Never mind that what had happened was my own stupidity; the computer hadn't made any attempt to stop me.

I had just deleted my only two copies of a program I had worked on for five solid days. Don't ask me why I did it; my brain must have been on automatic pilot. When I loaded and listed the disk directory to look for my program, it just wasn't there anymore. I began to panic.

But then I stopped to think. Deleting a file doesn't destroy it, I reminded myself. The physical records are still on the disk. Only the entry in the disk directory has been changed. If it could be changed back again, the file could be restored—as long as I didn't save any new programs on that disk.

Calmly, I extracted the disk from the drive, put it in a safe place and formatted a new one to take its place. A few minutes of thumbing through the 1541 disk drive manual told me what I needed to know: a single byte of data in the disk directory makes the difference between a living and a dead file. If I could change that byte back to the correct value, the file would magically reappear.

The question was how to get this byte off the disk, change it and put it back again. The disk commands Read-Block and Write-Block (or, alternatively, USER1 and USER2) could be used to get the relevant disk block out and back again. Making a *change* in that block, however, was something else.

It was clear that I needed a rather elaborate disk editor program. A quick check of my back issues of computer magazines made it obvious that I would have to write it myself.

The accompanying program listing is the fruit of my effort. Disk Editor 64 is a full-screen track-and-sector editor for Commodore 64 computers with 1541 disk drives. It allows you to call up any track and sector of a disk—a block, in Commodore parlance—modify it and put it back on the disk. It also allows you to scrap unrecorded modifications at any time and start again from scratch; a necessity, if you're having a day like the one I was having.

Did I save my file? Of course I did. How could I write programs like this if my computer were a pile of plastic pebbles?

Disk Geography

Formatting a disk divides its surface into a series of *tracks*, concentric magnetic rings on which magnetically encoded information can be recorded, and *sectors*, or segments of those rings. The information stored in one sector of a single track is called a *block*.

A block, which can contain up to 256 bytes of information, is the smallest unit in which you can store data on a disk. A logical sequence of blocks, containing a single program, or a series of records, or whatever, is called a *file*. The blocks that make up the file are not necessarily in order, but the Commodore disk operating system (DOS) treats them as though they were.

When you load a program from disk, the DOS consults the directory on that disk, finds out in which block that particular file begins and proceeds to transfer each block of the file, in its proper sequence, into the computer's

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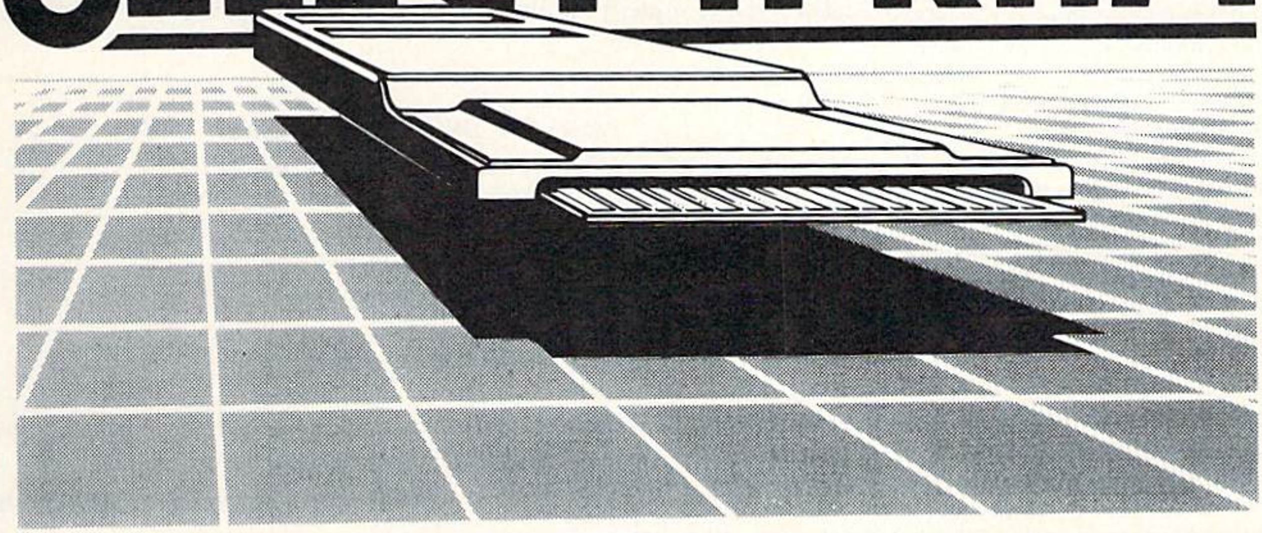

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Track #	High Sector #
1 - 17	20
18 - 24	18
25 - 30	17
31 - 35	16

Fig. 1. Sectors per track.

memory, as though the program had been stored as a single, consecutive unit. The blocks within a file are always identified, in the directory and elsewhere, by their track and sector numbers. I'll discuss this in more detail later.

When you run Disk Editor 64, it will prompt you for a track number. On the 1541 drive, this is any number between 1 and 35. You will then be prompted to supply a sector number. This is any number from 0 to the highest sector number for that particular track. Fig. 1 shows the number of sectors on each track.

You may respond to the prompt with either decimal or hexadecimal numbers in the allowed range. (Hexadecimal numbers are identified by a leading dollar sign ($).) Numbers outside of the allowed range will not be accepted.

If you choose, say, track 10 and sector 4, the legend READING TRACK 10 SECTOR 4 PART 1 will appear on the screen. (The "PART 1" refers to the fact that only half—128 bytes—of a block is shown on the screen at one time.) The contents of the block with that track and sector number will be displayed below the legend in both hexadecimal and ASCII.

When the display is complete, an unblinking cursor will appear in the upper left-hand corner of the hex dump, completely covering the first pair of hexadecimal digits. You can move this cursor with the normal cursor control keys and place it over any pair of hex digits that you want to change. You then simply type the new digits.

Note that you *must* change two digits at a time. That is, once you have typed a single hex digit, you must type the second digit in that pair before the cursor can be moved again. This may sound awkward, but you'll get used to it quickly enough.

Incidentally, the ASCII display is not updated when a change is made. You have to reload the block later, after editing is complete, to see your changes reflected in ASCII format.

Once you've finished making any changes in Part 1 of the block, press the return key; the block will be recorded, in its new form, back to the disk, and the screen will display Part 2. When you finish with Part 2, press the return key again; the block will be recorded, and you'll automatically be advanced to the next block in numerical sequence (rather than to the next block of the file).

Note that no changes are recorded to the disk until the return key is pressed. If, at any time prior to pressing Return, you should decide not to record the changes you've made, press the up-arrow key. (This is the key with the up-arrow character on it, not the up-cursor key.) The screen will clear, your changes will vanish, and you'll be prompted for a new track and sector.

Of course, you can also use Disk Editor 64 to read through and examine the tracks and sectors of the disk, without making any changes. Pressing the return key always advances you to the next sector (and the next track, if you're at the end of one), or to the second part of the current sector.

Listing. The Disk Editor 64 program.

```
0 REM ********************************
1 REM *                              *
2 REM *          EDITOR 64           *
3 REM *                              *
4 REM *             BY               *
5 REM *                              *
6 REM *        CHRIS LAMPTON         *
7 REM *                              *
8 REM ********************************
9 REM
10 DIMS%(35),B$(1):PRINTCHR$(147)CHR$(151);:POKE53280,1
    :POKE53281,1:GOSUB680
20 OPEN15,8,15:OPEN5,8,5,"#"
30 PRINTCHR$(147);:N=11:CH=17:GOSUB700:N=3:CH=29:GOSUB7
    00:PRINT"TRACK";:INPUTT$
35 N=3:CH=29:GOSUB700:PRINT"SECTOR";:INPUTS$:X=0:TF=0:S
    F=0
40 IFLEFT$(T$,1)="$"THENHX$=T$:GOSUB480:T=DC:TF=1
50 IFLEFT$(S$,1)="$"THENHX$=S$:GOSUB480:S=DC:SF=1
60 IFSF=0THENS=VAL(S$)
70 IFTF=0THENT=VAL(T$)
80 IFT<1ORT>35THEN30
90 IFS<0ORS>S%(T)THEN30
100 GOSUB350
110 PRINTCHR$(19);:N=5:CH=17:GOSUB700:N=6:CH=29:GOSUB70
     0:C=0:L=0
120 PRINTCHR$(18)CHR$(32)CHR$(32)CHR$(146)CHR$(157)CHR$
     (157);
125 DC=ASC(MID$(B$(X),L*8+C+2,1)+CHR$(0)):GOSUB450
130 GETK$:IFK$=""THEN130
140 IFK$=CHR$(29)THEN230
150 IFK$=CHR$(17)THEN260
160 IFK$=CHR$(145)THEN290
170 IFK$=CHR$(157)THEN320
180 IFK$=CHR$(13)THEN590
190 IF(K$=>"0"ANDK$=<"9")OR(K$=>"A"ANDK$=<"F")THEN530
200 IFK$=CHR$(94)THEN30
210 IFK$=CHR$(133)THENPRINT"{SHFT CLR}";:PRINT"EDITING
     TERMINATED":CLOSE15:CLOSE5:END
220 GOTO130
230 PRINTHX$CHR$(29);:C=C+1:IFC<8THEN120
240 N=16:CH=29:GOSUB700:L=L+1:C=0:IFL<16THEN120
250 GOTO110
260 PRINTHX$CHR$(157)CHR$(157)CHR$(17);:L=L+1:IFL<16THE
     N120
270 PRINTCHR$(19);:N=5:CH=17:GOSUB700:N=6:CH=29:GOSUB70
     0
275 IFC>0THENFORJ=1TOC*3:PRINTCHR$(29);:NEXT
280 L=0:GOTO120
290 PRINTHX$CHR$(157)CHR$(157)CHR$(145);:L=L-1:IFL=>0TH
     EN120
300 PRINTCHR$(19);:N=20:CH=17:GOSUB700:N=6:CH=29:GOSUB7
     00
305 IFC>0THENFORJ=1TOC*3:PRINTCHR$(29);:NEXT
```

More →

Pressing the up-arrow key will always return you to the track and sector prompt. Alternatively, pressing the F1 key will terminate the program, close all files, and return you to the Basic immediate mode.

A word of warning: If you type this program from the accompanying listing, don't try it out on a good disk. In fact, you'd best format a new disk just for the occasion and create some dummy files to work with. A single typo in the program could cause Disk Editor 64 to destroy an entire block. And if that block happens to contain the disk directory header, it could cause all the files on the disk to be discarded.

To guard against this, proofread the program carefully and then use it to make a few minor changes in an unused block. (Unused blocks are usually filled with hexadecimal 01s.) Record these changes to the disk, advancing to the next block, then hit the up-arrow key and go back and look at the first block again.

Listing continued.

```
310 L=15:GOTO120
320 PRINTHX$;:N=5:CH=157:GOSUB700:C=C-1:IFC=>0THEN120
330 C=7:L=L-1:N=16:CH=157:GOSUB700:IFL=>0THEN120
340 L=15:PRINTCHR$(19);:N=20:CH=17:GOSUB700:N=27:CH=29:
     GOSUB700:GOTO120
350 PRINTCHR$(147)CHR$(17)"READING TRACK"T" SECTOR"S" P
     ART"X+1:N=3
355 CH=17:GOSUB700
360 B$(X)="":PRINT#15,"U1:"5;0;T;S
365 PRINT#15,"B-P:"5,0
370 IFX=1THENFORI=1TO128:GET#5,A$:NEXT:GOTO380
375 B$(1)=""
380 FORJ=0TO15:DC=J*8+128*X:GOSUB450:PRINT"00"HX$"{2 SP
     ACEs}";:FORK=0TO7
390 GET#5,A$:A$=CHR$(ASC(A$+CHR$(0))):B$(X)=B$(X)+A$
400 DC=ASC(A$):GOSUB450:PRINTHX$"{SPACE}";:NEXT:PRINT"{
     SPACE}";:FORK=0TO7
410 DC=ASC(MID$(B$(X),J*8+K+1,1)+CHR$(0))
420 IF(DC>32ANDDC<128)ORDC>159THENPRINTCHR$(DC);:GOTO44
     0
430 PRINT".";
440 NEXT:PRINT:NEXT:B$(X)="{SPACE}"+B$(X)+"{SPACE}":RET
     URN
450 D1=INT(DC/16):D2=DC-D1*16
460 HX$=CHR$(D1+48-7*(D1>9))+CHR$(D2+48-7*(D2>9)):RETUR
     N
470 HX$=RIGHT$(HX$,LEN(HX$)-1):IFLEN(HX$)=0THENHX$="00"

480 IFLEN(HX$)=1THENHX$="0"+HX$
490 IFLEN(HX$)>2THENHX$=RIGHT$(HX$,2)
500 FORI=1TO2:A$=MID$(HX$,I,1)
505 IFA$<"0"OR(A$>"9"ANDA$<"A")ORA$>"F"THENDC=0:RETURN
510 K$=LEFT$(HX$,1):J$=RIGHT$(HX$,1)
520 D1=ASC(K$)-48:D2=ASC(J$)-48:DC=(D1+7*(D1>9))*16+(D2
     +7*(D2>9)):RETURN
530 PRINTK$"{CRSR LF}";
540 GETJ$:IFJ$=""THEN540
550 IFJ$<"0"OR(J$>"9"ANDJ$<"A")ORJ$>"F"THEN540
560 HX$=K$+J$:GOSUB520
570 B$(X)=LEFT$(B$(X),L*8+C+1)+CHR$(DC)+RIGHT$(B$(X),LE
     N(B$(X))-(L*8+C+2))
580 GOTO230
590 B$(X)=MID$(B$(X),2,LEN(B$(X))-2)
600 PRINT#15,"B-P:"5,0
610 PRINT#5,B$(0);B$(1);
620 PRINT#15,"U2:"5;0;T;S
630 IFX=0THENX=1:GOTO100
640 X=0:GOSUB650:GOTO100
650 S=S+1:IFS<=S%(T)THENRETURN
660 S=0:T=T+1:IFT<36THENRETURN
670 T=1:RETURN
680 FORI=1TO17:S%(I)=20:NEXT:FORI=18TO24:S%(I)=18:NEXT
690 FORI=25TO30:S%(I)=17:NEXT:FORI=31TO35:S%(I)=16:NEXT
     :RETURN
700 FORII=1TON:PRINTCHR$(CH);:NEXT:RETURN
```

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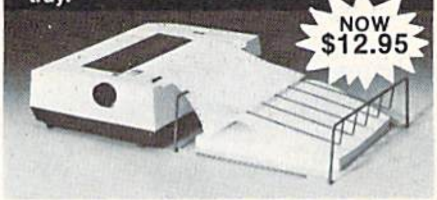

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If the changes—and everything else about the block, except the updated ASCII display—are exactly as you left them, then the program is probably okay. If not, proofread the program again. Don't use Disk Editor 64 on a good disk until you are sure that it has been properly typed.

Sampling Session

To further acquaint you with the features of Disk Editor 64, let's step through a sample editing session. Load the program, type RUN, and insert the disk you wish to edit in drive 0.

Generally, the first block that you'll want to inspect is the one that contains the disk directory: Track 18, Sector 1. This will tell you what program and sequential files are currently being kept on the disk, where they are located and how many blocks each is stored in.

To learn the specific format in which this information is stored, consult the charts in Appendix D of the *VIC-1541 User's Manual.* The information in the manual should be taken with a grain of salt, however; some of it is misleading. Use it as a guide for your own exploration of the disk.

When Disk Editor 64 asks for a track number, type 18 (or $12, in hexadecimal) and press Return. When it asks for a sector number, type 1 (hexadecimal $01) and press Return. Disk Editor 64 will display READING TRACK 18 SECTOR 1 PART 1 on the screen. Below this, you will see the first half of the block.

Notice that you can read in the ASCII dump the names of programs and sequential files stored on the disk. The three hexadecimal bytes before the first byte of each program name are crucial. The first of the three indicates the status of the file, according to the following chart:

$00 — Deleted
$81 — Sequential
$82 — Program
$83 — User
$84 — Relative

When I began to restore my deceased file, my main concern was in changing the status byte from the first of these numbers to the third—that is, altering the "00" designation of the deleted file to the "82" designation of the active program file. With Disk Editor 64, this is simple enough.

When the block cursor appears in the upper left-hand corner, advance it with the cursor control keys until it is positioned over the third byte (which should read 00) preceding the name of the dead file, and type the number 82. The file will be magically resurrected and restored to the directory, and now can be loaded like any other file, assuming that no new files have been recorded over it.

The next two bytes preceding the name contain the track and sector numbers of the block at which the file itself begins. If you'd like to take a look at a particular file, note these numbers, press the up-arrow key, and request Disk Editor 64 to show you that block. (Remember that these track and sector numbers are displayed in hexadecimal, and must be input preceded by a dollar sign, or in a decimal translation.)

The first two bytes of a program file contain the track and sector numbers of the next block in the file. The third and fourth bytes contain—in lo-byte/hi-byte order, backwards to the order in which you would normally read them—the load address for the program; that is, the memory address at which the file will load in memory, if loaded with the Load 8, 1 command. (For Basic programs, this address is usually $0801, the default address for all program loads.)

If you ever lose the SYS address for a machine language program, you can use Disk Editor 64 to locate the load address, since the SYS and load addresses are usually, though not invariably, the same. Changing these bytes will result in a new load location for the program, if you should find this desirable. Remember, however, that most machine language programs will not execute correctly if relocated.

The remaining bytes of the file contain the program itself, exactly as it was stored in the computer's memory. If it is a Basic program, this means that all keywords are tokenized—that is, reduced to a single byte—and each line of programming is terminated with a zero and preceded by four bytes indicating the memory location of the next line and the number of the current line.

With the VIC-1541 manual in hand, you can now proceed to explore the many secrets of the Commodore disk. When your exploration or editing is over, and the last edited block has been recorded to the disk, press F1 and you'll be back in Basic.

The uses of Disk Editor 64 are considerable, especially in the hands of an imaginative user. However, it will have done its job if it saves at least one more Commodore 64 from being reduced to a pile of plastic pebbles. R

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Maze of Intrigue

What good is a dungeon program without a maze—complete with open pits, cul-de-sacs, trap doors and secret passageways? This a-maze-ing little program brings 3-D excitement to your fantasy games.

By John Stilwell

Fantasy role-playing games have become very popular in the last few years. They started as a way for a few gifted people to experience the adventures they craved. Unfortunately, paper and pencil were all they had to make their imaginations manifest.

Eventually, books and various paraphernalia appeared, with miniature metal figurines probably the most popular for helping to visualize the action. You Are There is a program I developed to give a little more substance to these games. The program takes a map of a complex and makes it three dimensional so you can walk around inside.

You Are There runs on the Commodore VIC-20 with an 8K or larger memory expansion. It has two modes. The first is the edit mode. In this one, you draw and edit your maps.

In the second mode, the map is made three dimensional. You are also given commands so you can ad-lib various things like traps.

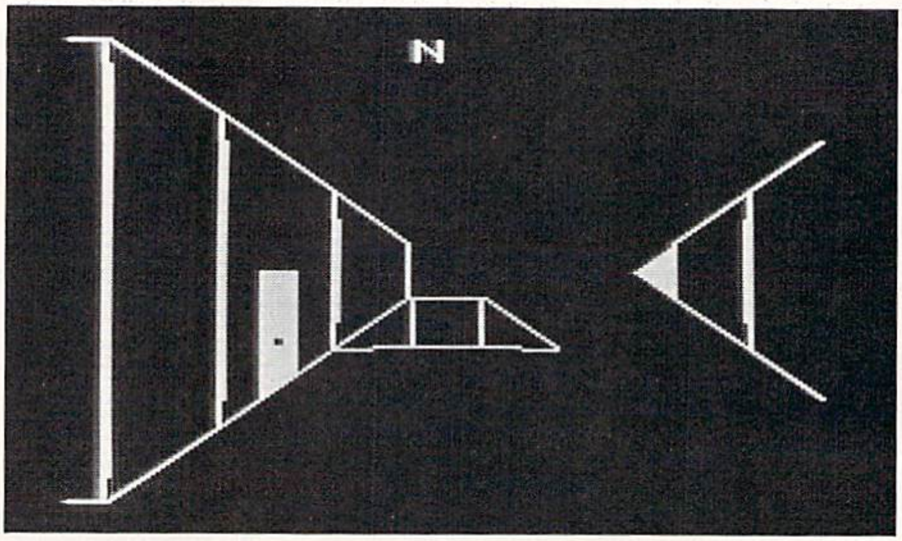
When you run the program, you'll first be asked for the name of the map that you intend to draw. If you push the return key without giving a name, "no-name" will be assigned to the map. You are then put into the edit mode.

A 21 × 21 grid map will be drawn on the screen, with nothing on it but a star in a white square. This is the cursor, which is moved with the cursor keys. To get the list of key definitions, push F1. The top row of the screen acts like a rolodex. Every time you push F1, you are given more codes.

You can only put one thing in each square. You have available four walls (one for each side of the square), four walls with doors in them, four corner pieces, a pit, a spiral staircase and a solid block. These pieces can be used in the map as many times as you like.

The rest of the commands are: S, to save a map to tape; L, to load a map from tape; *, to go back and forth between modes; n, to erase the map; and the space bar, to erase individual pieces on the map.

I suggest you use corner pieces whenever possible. If you don't, there may be minor cosmetic flaws when the picture is drawn.



Sample screen display from You Are There program.

RUN It Right

VIC-20 with at least
8K expansion

Address author correspondence to John Stilwell, 5018 Marathon Drive, Madison, WI 53705.

Now, let's try an example. Push the number eight. A line will appear in the middle of the square with a line pointing down. This short line tells you on which side of the square is the wall containing a door.

Moving the square to the left and pushing the number three puts a blank wall in the bottom of the square. Move the cursor down one.

Into 3-D

Now we will make the map three dimensional. The position of the cursor when you push the star is your location when you go into three dimensions.

Push the star and the screen will change color and go blank. After a few seconds, the screen will come back. The time that this takes depends on how much there is to draw. In the extrême case, it takes thirteen seconds.

At the top of the screen, you'll see an N. This means you're looking north. You change the direction you're looking by pushing N, S, W or E for north, south, west or east. To move forward, push the space bar.

Now back to the example. On the screen, you'll see a large square. Push the space bar once. The message "against wall" will flash on the screen. Push W and you'll look down the wall to the west and see a door in the wall.

Push the space bar and then the letter N. This will cause you to move to the west one square, then turn north and face the door. Push the space bar again. Once more the "against wall" message will flash.

This is because the doors are considered locked. To go through the door (or a wall), push the F7 key. The only thing you can't walk through is a solid block.

If you push F3, the floor will drop out from under you. This is the classic pit trap. To make a door (secret door) appear in a wall or in the air (phase door), push F1. You can even roll dice. F2 rolls a four-sided die. F4 rolls a six-sided die, F5 a ten-, F6 a 20-, and F8 a 100-sided die.

Now walk around and look at the wall from different angles and directions. You'll notice you can see only a distance of four squares. If you get hopelessly lost, push the star. This will put you back into the edit mode.

Even if you have never played Dungeons and Dragons, Rune Quest or any of the others, I'm sure you'll find this program interesting.

If you don't want to type this program in, send me three dollars and I'll be very happy to send you a tape. 🅁

Listing 1. You Are There program for the VIC-20 with 8K or larger memory expansion.

```
1 PRINT"{SHFT CLR}{2 CRSR DNs}{CTRL 1}{3 SPACEs}{CTRL 9
     }{15 SPACEs}":PRINT"{3 SPACEs}{CTRL 9}YOU ARE THER
     E":PRINT"{3 SPACEs}{CTRL 9}{15 SPACEs}{2 CRSR DNs}
     "
2 PRINT"{7 CRSR DNs}{3 SPACEs}BY JOHN STILWELL
5 DIME%(5,5),M%(20,20):FORI=0TO20:FORJ=0TO20:M%(I,J)=16
     0:N$="NO NAME":NEXTJ,I
6 PRINT"{SHFT CLR}{CRSR DN}THE NEW MAP'S NAME?":INPUTN$
     :G=1
7 Q=3:P=5:Z=0:Y=-1:AI=-1:AJ=0:DI$="N":GOSUB499:GOSUB507
     :GOTO9
8 GOSUB504
9 FOR A=0TO4:FORB=-2TO2
11 H=Q+A*Z+B*AI:M=P+A*Y+B*AJ
13 IFH>20ORM>20ORH<0ORM<0THENE%(B+3,A+1)=0:GOTO17
15 E%(B+3,A+1)= M%(H,M)
17 NEXTB,A:IFDI$="N"THEN117.
19 FORA=1TO5:FORB=1TO5:I=E%(A,B)-203:IFI<1THEN115
21 IFDI$="W"THEN85
23 IFDI$="E"THEN55
25 ONIGOTO43,115,115,35,47
27 I=I-30:IFI>0THENONIGOTO51,53,115,115,115,45,115,33,4
     9,41,37,115,115,31,115,115,39
29 GOTO115
31 E%(A,B)=239:GOTO115
33 E%(A,B)=242:GOTO115
35 E%(A,B)=250:GOTO115
37 E%(A,B)=234:GOTO115
39 E%(A,B)=207:GOTO115
41 E%(A,B)=235:GOTO115
43 E%(A,B)=208:GOTO115
45 E%(A,B)=247:GOTO115
47 E%(A,B)=204:GOTO115
49 E%(A,B)=241:GOTO115
51 E%(A,B)=244:GOTO115
53 E%(A,B)=243:GOTO115
55 ONIGOTO77,115,115,65,71
57 I=I-30:IFI>0THENONIGOTO81,83,115,115,115,73,115,63,7
     9,67,69,115,115,61,115,115,75
59 GOTO115
61 E%(A,B)=244:GOTO115
63 E%(A,B)=243:GOTO115
65 E%(A,B)=204:GOTO115
67 E%(A,B)=242:GOTO115
69 E%(A,B)=239:GOTO115
71 E%(A,B)=207:GOTO115
73 E%(A,B)=234:GOTO115
75 E%(A,B)=208:GOTO115
77 E%(A,B)=250:GOTO115
79 E%(A,B)=235:GOTO115
81 E%(A,B)=247:GOTO115
83 E%(A,B)=241:GOTO115
85 ONIGOTO109,115,115,97,101
87 I=I-30
88 IFI>0THENONIGOTO111,113,115,115,115,103,115,93,107,9
     9,95,115,115,91,115,115,105
89 GOTO115
91 E%(A,B)=234:GOTO115
93 E%(A,B)=235:GOTO115
95 E%(A,B)=247:GOTO115
97 E%(A,B)=208:GOTO115
99 E%(A,B)=241:GOTO115
101 E%(A,B)=250:GOTO115
103 E%(A,B)=244:GOTO115
105 E%(A,B)=204:GOTO115
107 E%(A,B)=243:GOTO115
109 E%(A,B)=207:GOTO115
```

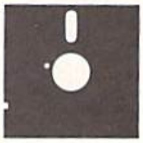
More →

Listing 1 continued.

```
111 E%(A,B)=239:GOTO115
113 E%(A,B)=242
115 NEXTB,A
117 I=0:GOSUB669:GOSUB275:FORA=5TO1STEP-1:FORB=2TO1STEP
     -1:GOSUB121:NEXTB:FORB=-2TO0
119 GOSUB121:NEXTB,A:I=22:GOSUB669:GOTO161
121 D=B+3:J=E%(B+3,A):IFJ=160THENRETURN
123 IFJ=137THENONAGOSUB231,233,235,237,273
125 D=B+3:J=J-203:IFJ>0THENONJGOTO151,129,129,155,157,1
     29,129,129,129,129,153,139
127 J=J-30
128 IFJ>0THENONJGOTO137,147,129,129,129,135,129,141,145
     ,143,133,129,129,131,129,129,149
129 RETURN
131 GOSUB223:RETURN
133 GOSUB225:RETURN
135 GOSUB227:RETURN
137 GOSUB229:RETURN
139 ONAGOSUB239,241,243,245,273:RETURN
141 GOSUB223:ONAGOSUB247,249,251,273,273:RETURN
143 GOSUB225:D=B+3:ONAGOSUB273,253,261,273,273:RETURN
145 GOSUB227:ONAGOTO273,247,249,251,273:RETURN
147 GOSUB229:ONAGOSUB273,263,265,273,273:RETURN
149 GOSUB229:GOSUB227:D=B+3:GOSUB215:RETURN
151 GOSUB225:D=B+3:IFD<>0THEN:GOSUB227:D=B+3:GOSUB219:R
     ETURN
153 GOSUB223:GOSUB225:D=B+3:GOSUB229:GOSUB227:GOSUB215:
     GOSUB219:RETURN
155 GOSUB223:GOSUB225:RETURN
157 GOSUB223:GOSUB229
159 RETURN
161 GETA$:PRINT"{HOME}{CRSR DN}"TAB(10)""DI$:IFA$=""THE
     N161
163 IFA$="N"THENZ=0:Y=-1:AI=-1:AJ=0:DI$="N":GOTO9
165 IFA$=DI$THEN161
167 IFA$="{SPACE}"THEN655
169 IFA$="{FUNCT 7}"THEN659
171 IFA$="*"THEN8
173 IFA$="E"THENZ=1:Y=0:AI=0:AJ=-1:DI$="E":GOTO9
175 IFA$="S"THENZ=0:Y=1:DI$="S":AI=1:AJ=0:GOTO9
177 IFA$="{FUNCT 2}"THENDC=4:GOSUB645
179 IFA$="{FUNCT 4}"THENDC=6:GOSUB645
181 IFA$="{FUNCT 6}"THENDC=20:GOSUB645
183 IFA$="{FUNCT 5}"THENDC=10:GOSUB645
185 IFA$="{FUNCT 8}"THENDC=100:GOSUB645
187 IFA$="{FUNCT 1}"THENGOSUB441
189 IFA$="{FUNCT 3}"THENGOSUB411
191 IFA$="W"THENZ=-1:Y=0:DI$="W":AI=0:AJ=1:GOTO9
193 GOTO161
195 RETURN
197 ONDGOTO273,273,359,357,273,273
199 ONDGOTO273,351,353,345,273
201 ONDGOTO273,273,347,341,273,273
203 ONDGOTO273,327,331,321,319,273
205 ONDGOTO273,335,337,325,159
207 ONDGOTO273,307,311,301,297,273
209 ONDGOTO309,315,317,305,299
211 ONDGOTO273,287,293,283,279,273
213 ONDGOTO285,289,295,281,277
215 K=E%(D-1,A):IFK=239ORK=204ORK=214ORK=250THENONAGOTO
     273,255,257,259,273
217 RETURN
219 D=B+4
220 IFD<6THENK=E%(D,A):D=D-1:IFK=239ORK=204ORK=214ORK=2
     50THENONAGOTO273,267,269,271,273
221 RETURN
223 ONAGOTO199,205,209,213,159
225 D=B+4:ONAGOTO197,201,203,207,211
227 ONAGOTO159,199,205,209,213,159
229 ONAGOTO197,201,203,207,211
231 ONDGOTO273,273,485,273,273
233 ONDGOTO273,273,481,273,273
235 ONDGOTO273,477,475,473,273
237 ONDGOTO471,469,465,461,463
239 ONDGOTO273,421,411,409,273
241 ONDGOTO273,407,403,401,273
243 ONDGOTO399,397,393,391,389
245 ONDGOTO379,377,365,363,361
247 ONDGOTO273,273,441,273,273
249 ONDGOTO273,439,435,433,273
251 ONDGOTO273,429,427,425,273
253 ONDGOTO273,459,457,273,273
255 ONDGOTO273,273,367,273,273
257 ONDGOTO273,273,369,273,273
259 ONDGOTO273,371,373,273,273
261 ONDGOTO453,451,447,445,273
263 ONDGOTO273,273,459,457,273
265 ONDGOTO273,453,451,447,445
267 ONDGOTO273,273,381,273,273
269 ONDGOTO273,273,383,273,273
271 ONDGOTO273,273,385,387,273
273 RETURN
275 PRINT"{SHFT CLR}":RETURN
277 PRINT"{HOME}"TAB(199)"{3 COMD Ts}{SHFT P}{CRSR DN}{
     4 CRSR LFs}{3 COMD @s}{SHFT @}":RETURN
```

More

Question:
What do Ryo Kawasaki, Commodore 64* and songs by Michael Jackson and Lionel Richie all have in common?



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Listing 1 continued.

```
279 PRINT"{HOME}"TAB(203)"{CTRL 9}{COMD *}{CRSR DN}{CRS
     R LF}{CTRL 0}{SHFT LB.}":RETURN
281 PRINT"{HOME}"TAB(203);:GOTO291
283 PRINT"{HOME}"TAB(208)"{CTRL 9}{COMD *}{CRSR DN}{CRS
     R LF}{CTRL 0}{SHFT LB.}":RETURN
285 PRINT"{HOME}"TAB(215)"{SHFT O}{3 COMD Ts}{CRSR DN}{
     4 CRSR LFs}{SHFT L}{3 COMD @s}":RETURN
287 PRINT"{HOME}"TAB(214)"{CTRL 9}{SHFT LB.}{CRSR DN}{C
     RSR LF}{CTRL 0}{COMD *}":RETURN
289 PRINT"{HOME}"TAB(210);
291 PRINT"{SHFT O}{3 COMD Ts}{SHFT P}{CRSR DN}{5 CRSR L
     Fs}{SHFT L}{3 COMD @s}{SHFT @}":RETURN
293 PRINT"{HOME}"TAB(209)"{CTRL 9}{SHFT LB.}{CRSR DN}{C
     RSR LF}{CTRL 0}{COMD *}":RETURN
295 PRINT"{HOME}"TAB(208)"{SHFT O}{SHFT P}{CRSR DN}{2 C
     RSR LFs}{SHFT L}{SHFT @}":RETURN
297 PRINT"{HOME}"TAB(156);:GOTO303
299 PRINT"{HOME}"TAB(155)"{COMD T}{SHFT P}{CRSR DN}{CRS
     R LF}{COMD M}{CRSR DN}{2 CRSR LFs} {COMD M}{CRSR D
     N}{2 CRSR LFs} {COMD M}{CRSR DN}{CRSR LF}{COMD M}{
     CRSR DN}{2 CRSR LFs}{COMD @}{SHFT @}":RETURN
301 PRINT"{HOME}"TAB(161);
303 PRINT"{COMD M}{SHFT M}{CRSR DN}{CRSR LF}{COMD G}{SH
     FT M}{CRSR DN}{2 CRSR LFs}{COMD G}{COMD M}{CRSR DN
     }{2 CRSR LFs}{COMD G}{COMD M}{CRSR DN}{2 CRSR LFs}
     {COMD G}{SHFT N}{CRSR DN}{3 CRSR LFs}{COMD M}{SHFT
      N}":RETURN
305 PRINT"{HOME}"TAB(157)"{SHFT O}{3 COMD Ts}{SHFT P}":
     FORI=1TO4:PRINTTAB(3)"{COMD G}    {COMD M}":NEXTI:P
     RINT"{3 [CRSR RT]s}{SHFT L}{3 COMD @s}{SHFT @}":RE
     TURN
307 PRINT"{HOME}"TAB(172);:GOTO313
309 PRINT"{HOME}"TAB(173)"{SHFT O}{COMD T}{CRSR DN}{2 C
     RSR LFs}{COMD G}{CRSR DN}{CRSR LF}{COMD G} {CRSR D
     N}{2 CRSR LFs}{COMD G} {CRSR DN}{2 CRSR LFs}{COMD
     G}{CRSR DN}{CRSR LF}{SHFT L}{COMD @}":RETURN
311 PRINT"{HOME}"TAB(167);
313 PRINT"{SHFT N}{COMD G}{CRSR DN}{3 CRSR LFs}{SHFT N}
     {COMD M}{CRSR DN}{2 CRSR LFs}{COMD G}{COMD M}{CRSR
      DN}{2 CRSR LFs}{COMD G}{COMD M}{CRSR DN}{2 CRSR L
     Fs}{SHFT M}{COMD M}{CRSR DN}{CRSR LF}{SHFT M}{COMD
      G}":RETURN
315 PRINT"{HOME}"TAB(168)"{SHFT O}{3 COMD Ts}{SHFT P}":
     FORI=1TO4:PRINTTAB(14)"{COMD G}{3 SPACEs}{COMD M}"
     :NEXTI
316 PRINTTAB(14)"{SHFT L}{3 COMD @s}{SHFT @}":RETURN
317 PRINT"{HOME}"TAB(162)"{SHFT O}{4 COMD Ts}{SHFT P}":
     FORI=1TO4:PRINTTAB(8)"{COMD G}{4 SPACEs}{COMD M}":
     NEXTI
318 PRINTTAB(8)"{SHFT L}{4 COMD @s}{SHFT @}":RETURN
319 PRINT"{HOME}{CRSR RT}{5 CRSR DNs}{SHFT M}{CRSR DN}{
     SHFT M}{CRSR DN}{2 CRSR LFs} {COMD M}{CRSR DN}{CRS
     R LF}{COMD M}{CRSR DN}{2 CRSR LFs} {COMD M}{CRSR D
     N}{2 CRSR LFs} {COMD M}";
320 PRINT"{CRSR DN}{CRSR LF}{COMD M}{CRSR DN}{2 CRSR LF
     s} {COMD M}{CRSR DN}{CRSR LF}{SHFT N}{CRSR DN}{2 C
     RSR LFs}{SHFT N}":RETURN
321 PRINT"{HOME}"TAB(4)"{4 CRSR DNs}{COMD M}{SHFT M}{CR
     SR DN}{CRSR LF}{COMD G}{SHFT M}{CRSR DN}{2 CRSR LF
     s}{COMD G} {SHFT M}":FORI=1TO6:PRINTTAB(5)"{COMD G
     } {COMD M}":NEXTI
323 PRINTTAB(5)"{COMD G} {SHFT N}{CRSR DN}{3 CRSR LFs}{
     COMD G}{SHFT N}{CRSR DN}{3 CRSR LFs}{COMD M}{SHFT
     N}":RETURN
325 PRINT"{HOME}{CRSR RT}{4 CRSR DNs}{3 COMD Ts}{SHFT P
     }":FORI=1TO10:PRINT"{CRSR RT}   {COMD M}":NEXTI:PR
     INT"{CRSR RT}{3 COMD @s}{SHFT @}":RETURN
327 PRINT"{HOME}"TAB(20)"{5 CRSR DNs}{SHFT N}{CRSR DN}{
     2 CRSR LFs}{SHFT N}{CRSR DN}{CRSR LF}{COMD G} ":FO
     RI=1TO4:PRINT{2 COMD Gs} ":NEXTI
329 PRINTTAB(19)"{COMD G} {CRSR DN}{2 CRSR LFs}{SHFT M}
     {CRSR DN}{SHFT M}":RETURN
331 PRINT"{HOME}"TAB(14)"{6 CRSR DNs}{SHFT N}{CRSR UP}{
     SHFT N}{CRSR UP}{SHFT N}{COMD G}{CRSR DN}{2 CRSR L
     Fs}{COMD M}{CRSR DN}{CRSR LF}{COMD M}":FORI=1TO6:P
     RINTTAB(14)"{COMD G} {COMD M}":NEXTI
333 PRINTTAB(14)"{SHFT M}{CRSR DN}{SHFT M}{CRSR DN}{SHF
     T M}{COMD G}{CRSR UP}{2 CRSR LFs}{COMD M}{CRSR UP}
     {CRSR LF}{COMD M}":RETURN
335 PRINT"{HOME}"TAB(17)"{4 CRSR DNs}{SHFT O}{3 COMD Ts
     }":FORI=1TO10:PRINTTAB(17)"{COMD G}   ":NEXTI
336 PRINTTAB(17)"{SHFT L}{3 COMD @s}":RETURN
337 PRINT"{HOME}"TAB(5)"{4 CRSR DNs}{SHFT O}{10 COMD Ts
     }{SHFT P}":FORI=1TO10:PRINTTAB(5)"{COMD G}{10 SPAC
     Es}{COMD M}":NEXTI
339 PRINTTAB(5)"{SHFT L}{10 COMD @s}{SHFT @}":RETURN
341 PRINT"{HOME}{CRSR DN}{CRSR RT}{COMD M}{SHFT M}{CRSR
      DN}{CRSR LF}{COMD G}{SHFT M}{CRSR DN}{2 CRSR LFs}
     {COMD G} {SHFT M}":FORI=1TO12:PRINT"{2 CRSR RTs}{C
     OMD G} {COMD M}":NEXTI
343 PRINT"{2 CRSR RTs}{COMD G} {SHFT N}{CRSR DN}{3 CRSR
      LFs}{COMD G}{SHFT N}{CRSR DN}{3 CRSR LFs}{COMD M}
     {SHFT N}":RETURN
345 PRINT"{HOME}{CRSR DN}{CRSR RT}{SHFT P}":FORI=1TO16:
     PRINT"{CRSR RT}{COMD M}":NEXTI:PRINT"{CRSR RT}{SHF
     T @}":RETURN
347 PRINT"{HOME}"TAB(17)"{3 CRSR DNs}{SHFT N} {COMD M}{
     CRSR UP}{2 CRSR LFs}{SHFT N}{COMD M}{CRSR UP}{CRSR
      LF}{SHFT N}{COMD G}{2 CRSR DNs}":FORI=1TO12:PRINT
     TAB(17)"{COMD G} {COMD M}":NEXTI
349 PRINTTAB(17)"{SHFT M} {COMD M}{CRSR DN}{2 CRSR LFs}
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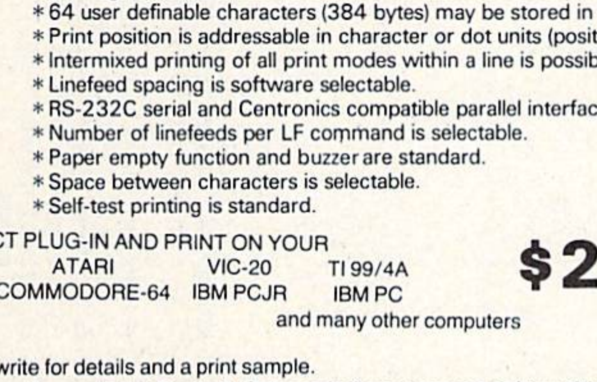
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A perfect investment to give your family and yourself more enjoyment and use from your home computer! The ease of operation, the neat appearance, and the real POWER it adds to your VIC at this low price makes it a MUST for every VIC home!

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To equal the total memory of RAMAX™ you would have to buy a 16k Memory Expansion, PLUS an 8k Expansion, PLUS 3k Expansion. THEN you would need a "mother board". With RAMAX™ you buy just ONE piece . . . at ABOUT HALF THE PRICE!

RAMAX™ Features and Specifications:

- Adds up to a full 27k bytes of additional RAM to the standard VIC-20's internal RAM of 5k.
- Built-in switch allows User selection of any combination of 5 areas or RAM memory*:
  BLK1 (8k: Adr. 8192-16383
  BLK 2 (8k: Adr. 16384-24575)
  BLK 3 (8k: Adr. 24576-32767)
  BLK 5 (Adr. 40960-49151, allows/disallows 8k ROM games)
  RAM (3k: Adr. 1024-4095)
  RESET (Resets computer without power off/on)
- Built-in electrical Fuse to protect equipment.
- Totally self-contained. No external power supply needed.
- Two (2) extension connectors allow ANY additional cartridges and/or devices designed for the VIC expansion port.
- Very low power consumption (.175 amp usual).
- High reliability gold-plated connectors are designed for long life.
- Complete Operating Manual.
- 6 month parts and labor warranty to original purchaser.
- Factory service.

*Many VIC-20 cartridges and programs require certain configurations of the memory (i.e certain games will only run on the unexpanded VIC while others require the upper portion of the expanded memory). With RAMAX™ you have switches that turn-on and turn-off portions of the memory to provide the right area of memory - all without plugging or unplugging. It's so easy!

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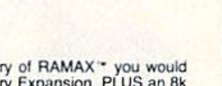
Shown with case removed



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APROPOS TECHNOLOGY

Listing 1 continued.

```
     {SHFT M}{COMD M}{CRSR DN}{CRSR LF}{SHFT M}{COMD G}
     ":RETURN
351 PRINT"{HOME}"TAB(20)"{CRSR DN}{SHFT O}":FORI=1TO16:
     PRINTTAB(20)"{COMD G}":NEXTI:PRINTTAB(20)"{SHFT L}
     ":RETURN
353 PRINT"{HOME}{2 CRSR RTs}{CRSR DN}{SHFT O}{16 COMD T
     s}{SHFT P}":FORI=1TO16:PRINT"{2 CRSR RTs}{COMD G}{
     16 SPACEs}{COMD M}":NEXT
355 PRINT"{2 CRSR RTs}{SHFT L}{16 COMD @s}{SHFT @}":RET
     URN
357 PRINT"{HOME}{CRSR RT}{SHFT M}":FORI=1TO18:PRINT"{CR
     SR RT}{COMD M}":NEXTI:PRINT"{CRSR RT}{SHFT N}":RET
     URN
359 PRINT"{HOME}"TAB(20)"{SHFT N}":FORI=1TO18:PRINTTAB(
     20)"{COMD G}":NEXTI:PRINTTAB(20)"{SHFT M}":RETURN
361 PRINT"{HOME}"TAB(243)"{3 COMD Ts}{SHFT LB.}{CRSR DN
     }{4 CRSR LFs}{2 COMD @s}{SHFT N}":RETURN
363 PRINT"{HOME}"TAB(245)"{CRSR DN}{SHFT N}{CRSR DN}{CR
     SR LF}{COMD T}{CRSR UP}{COMD @}{SHFT L}{2 COMD @s}
     {CRSR UP}{4 CRSR LFs}{SHFT N}{SHFT O}{3 COMD Ts}{S
     HFT LB.}{CRSR DN}{2 CRSR LFs}{SHFT N}":RETURN
365 PRINT"{HOME}"TAB(250)"{CRSR DN}{SHFT N}{CRSR DN}{CR
     SR LF}{COMD T}{CRSR UP}{COMD @}{SHFT L}{SHFT @}{CO
     MD @}{CRSR UP}{4 CRSR LFs}{SHFT N}{SHFT O}{SHFT P}
     {SHFT M}{CRSR DN}{SHFT M}{CRSR DN}{CRSR LF}{COMD T
     }":RETURN
367 PRINT"{HOME}"TAB(42)"{SHFT O}"TAB(176)TAB(218)"{SHF
     T L}":RETURN
369 PRINT"{HOME}"TAB(105)"{SHFT O}"TAB(215)TAB(61)"{SHF
     T L}":RETURN
371 PRINT"{HOME}"TAB(173)"{SHFT O}"TAB(129)"{SHFT L}":R
     ETURN
373 PRINT"{HOME}"TAB(168)"{SHFT O}"TAB(124)"{SHFT L}":R
     ETURN
375 RETURN
377 PRINT"{HOME}"TAB(254)"{COMD *}{3 COMD Ts}{SHFT P}{S
     HFT M}{CRSR DN}{SHFT M}{6 CRSR LFs}{SHFT M}{2 COMD
      @s}{SHFT @}{COMD @}{CRSR DN}{COMD T}{CRSR UP}{CRS
     R LF}{SHFT M}":RETURN
379 PRINT"{HOME}"TAB(255)"{4 CRSR RTs}{COMD *}{3 COMD T
     s}{CRSR DN}{3 CRSR LFs}{SHFT M}{2 COMD @s}": RETUR
     N
381 PRINT"{HOME}"TAB(23)"{SHFT P}"TAB(242)TAB(133)"{SHF
     T @}": RETURN
383 PRINT"{HOME}"TAB(92)"{SHFT P}"TAB(246)"{SHFT @}":RE
     TURN
385 PRINT"{HOME}"TAB(161)"{SHFT P}"TAB(117)"{SHFT @}":R
     ETURN
387 PRINT"{HOME}"TAB(156)"{SHFT P}"TAB(112)"{SHFT @}":R
     ETURN
```

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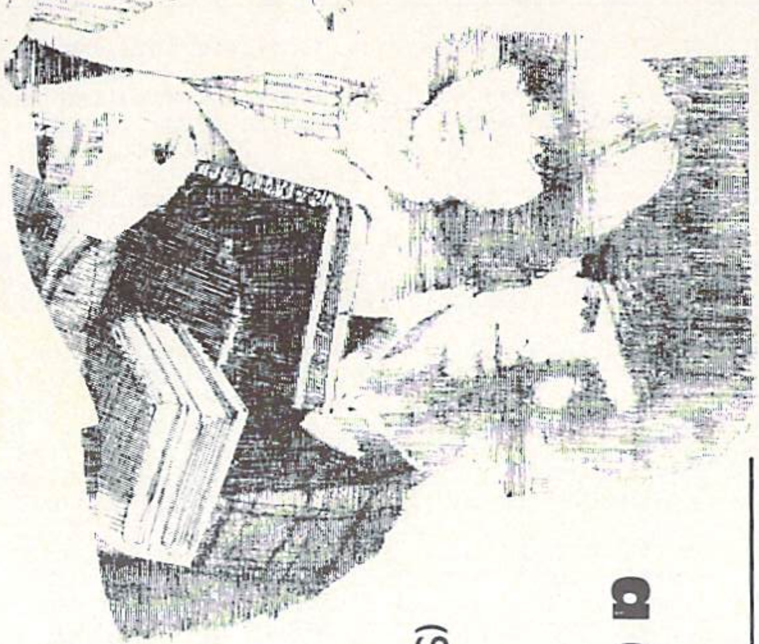
Listing 1 continued.

```
389 PRINT"{HOME}{CRSR RT}{2 CRSR DNs}"TAB(243)"{COMD T}
    {SHFT LB.}{CRSR DN}{2 CRSR LFs}{SHFT N}":RETURN
391 PRINT"{HOME}{2 CRSR RTs}{2 CRSR DNs}"TAB(244)"{SHFT
     N}{SHFT O}{3 COMD Ts}{CRSR DN}{6 CRSR LFs}{SHFT N
    } {COMD G}  {CRSR DN}{5 CRSR LFs}{2 COMD @s}{SHFT
    L}{COMD @}{SHFT N}{CRSR UP}{SHFT N}{CRSR UP}{SHFT
    LB.}{3 CRSR DNs}":RETURN
393 PRINT"{HOME}"TAB(247)"{4 CRSR DNs}{SHFT N}{CRSR DN}
    {CRSR LF}{COMD T}{CRSR UP}{2 COMD @s}{SHFT L}{4 CO
    MD @s}{SHFT @}{2 COMD @s}{CRSR DN}{COMD T}{CRSR LF
    }{CRSR UP}{SHFT M}";
394 PRINT"{CRSR UP}{11 CRSR LFs}{SHFT N} {COMD G}    {C
    OMD M} {SHFT M}{CRSR UP}{9 CRSR LFs}{SHFT N}{SHFT
    O}{4 COMD Ts}{SHFT P}{SHFT M}"
395 RETURN
397 PRINT"{HOME}"TAB(234)"{3 CRSR DNs}{COMD *}{CRSR DN}
    {SHFT M}{CRSR DN}{SHFT M}{2 CRSR UPs}{2 CRSR LFs}{
    3 COMD Ts}{SHFT P}{SHFT M}{CRSR DN}{4 CRSR LFs}  {
    COMD M} {SHFT M}{CRSR DN}{4 CRSR LFs}{COMD @}{SHFT
     @}{2 COMD @s}":RETURN
399 PRINT"{HOME}"TAB(239)"{3 CRSR DNs}{COMD *}{CRSR DN}
    {SHFT M}{CRSR UP}{CRSR LF}{COMD T}":RETURN
401 PRINT"{HOME}{CRSR RT}"TAB(243)"{5 CRSR DNs}{3 COMD
    Ts}{SHFT LB.}{CRSR DN}{4 CRSR LFs}  {SHFT N}{CRSR
    DN}{3 CRSR LFs}{COMD @}{SHFT N}":RETURN
403 PRINT"{HOME}"TAB(246)"{5 CRSR DNs}{SHFT N}{SHFT O}{
    10 COMD Ts}{SHFT P}{SHFT M}{CRSR DN}{15 CRSR LFs}{
    SHFT N} {COMD G}             {COMD M} {SHFT M}"
405 PRINT"{2 CRSR RTs}{SHFT N}{CRSR DN}{CRSR LF}{COMD T
    }{CRSR UP}{2 COMD @s}{SHFT L}{10 COMD @s}{SHFT @}{
    2 COMD @s}{CRSR DN}{COMD T}{CRSR LF}{CRSR UP}{SHFT
     M}":RETURN
407 PRINT"{HOME}"TAB(237)"{6 CRSR DNs}{COMD *}{3 COMD T
    s}{CRSR DN}{3 CRSR LFs}{SHFT M}{CRSR DN}{SHFT M}{C
    OMD @}":RETURN
409 PRINT"{HOME}"TAB(243)TAB(177)"{SHFT LB.}":RETURN
411 I=22:GOSUB669:PRINT"{HOME}"TAB(243)TAB(177)"{SHFT N
    }{SHFT O}{16 COMD Ts}{SHFT P}{SHFT M}":FORJ=1TO7:G
    OSUB665
413 GOSUB667:NEXTJ:PRINT"{HOME}"TAB(243)"{3 CRSR DNs}{C
    OMD T}{SHFT O}{16 COMD Ts}{SHFT P}{COMD T}":GOSUB6
    65
415 PRINT"{C{2 CRSR UPs}{CRSR LF}{SHFT M}{18 SPACEs}{SH
    FT N}{CRSR DN}{CRSR LF} ":GOSUB665
417 PRINT"{6 CRSR DNs}":FORJ=1TO15:GOSUB667:GOSUB665:NE
    XTJ
419 PRINT" {CRSR DN}{SHFT N}{CRSR UP}{SHFT L}{16 COMD @
    s}{SHFT @}{CRSR DN}{SHFT M}{2 CRSR DNs}":RETURN
```

More →



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Listing 1 continued.

```
421 PRINT"{HOME}"TAB(243)TAB(196)"{COMD *}{HOME}":RETUR
     N
423 REMDOOR 15
425 PRINT"{HOME}"TAB(203);:GOTO431
427 PRINT"{HOME}"TAB(208);:GOTO431
429 PRINT"{HOME}"TAB(214);:GOTO431
431 PRINT"{COMD @}{CRSR DN}{2 CRSR LFs}{COMD M} {COMD G
     }{CRSR DN}{3 CRSR LFs}{COMD M}'{COMD G}{CRSR DN}{3
      CRSR LFs}{SHFT @}{COMD @}{SHFT L}":RETURN
433 PRINT"{HOME}"TAB(198)"{CRSR RT}{COMD @}{CRSR DN}{CO
     MD G}{CRSR DN}{2 CRSR LFs} {COMD G}{CRSR DN}{2 CRS
     R LFs} {COMD G}{CRSR DN}{2 CRSR LFs}'{COMD G}{CRSR
      DN}{2 CRSR LFs} {COMD G}{CRSR DN}{2 CRSR LFs}{COM
     D @}{SHFT L}":RETURN
435 PRINT"{HOME}"TAB(207)"{2 COMD @s}{CRSR DN}{3 CRSR L
     Fs}{COMD M}  {COMD G}{CRSR DN}{4 CRSR LFs}{COMD M}
       {COMD G}{CRSR DN}{3 CRSR LFs}";
436 PRINT"{CRSR LF}{COMD M}  {COMD G}{CRSR DN}{4 CRSR L
     Fs}{COMD M} '{COMD G}{CRSR DN}{4 CRSR LFs}{COMD M}
       {COMD G}{CRSR DN}{4 CRSR LFs}{SHFT @}{2 COMD @s}
     {SHFT L}"
437 RETURN
439 PRINT"{HOME}"TAB(240)"{COMD M}{CRSR DN}{CRSR LF}{CO
     MD M}{CRSR DN}{CRSR LF}{COMD M}{CRSR DN}{CRSR LF}{
     COMD M}{CRSR DN}{CRSR LF}{COMD M}{CRSR DN}{CRSR LF
     }{SHFT @}":RETURN
441 PRINT"{HOME}"TAB(228)"{SHFT O}{2 COMD Ts}{SHFT P}{C
     RSR DN}{CRSR LF}{COMD M}{CRSR DN}{CRSR LF}{COMD M}
     {CRSR DN}{CRSR LF}{COMD M}{CRSR DN}{2 CRSR LFs}{SH
     FT N}{COMD M}{CRSR DN}{CRSR LF}{COMD M}{CRSR DN}{C
     RSR LF}";
442 PRINT"{COMD M}{CRSR DN}{CRSR LF}{COMD M}{CRSR DN}{C
     RSR LF}{SHFT @}{4 CRSR LFs}{SHFT L}{2 COMD @s}{3 C
     RSR LFs}{CRSR UP}{CRSR LF}{COMD L}{COMD G}{CRSR UP
     }{CRSR LF}{COMD G}";
443 PRINT"{CRSR UP}{CRSR LF}{COMD G}{CRSR UP}{CRSR LF}{
     COMD G}{CRSR UP}{CRSR LF}{COMD G}{CRSR UP}{2 CRSR
     LFs}{COMD L}{COMD G}{CRSR UP}{CRSR LF}{COMD G}":RE
     TURN
445 PRINT"{HOME}{CRSR RT}"TAB(221);:GOTO449
447 PRINT"{HOME}"TAB(226);:
449 PRINT"{CTRL 9} {CRSR DN}{CRSR LF} {CRSR DN}{CRSR LF
     }.{CRSR DN}{CRSR LF} {CRSR DN}{CRSR LF}{CTRL 0}{SH
     FT LB.}":RETURN
451 PRINT"{HOME}"TAB(235);:GOTO455
453 PRINT"{HOME}"TAB(240);
455 PRINT"{CTRL 9} {CRSR DN}{CRSR LF} {CRSR DN}{CRSR LF
     }.{CRSR DN}{CRSR LF} {CRSR DN}{CRSR LF}{CTRL 0}{CO
     MD *}":RETURN
457 PRINT"{HOME}"TAB(223)"{CTRL 9} {CRSR DN}{CRSR LF} {
     CRSR DN}{CRSR LF} {CRSR DN}{CRSR LF}.{CRSR DN}{CRS
     R LF} {CRSR DN}{CRSR LF} {CRSR DN}{CRSR LF} {CRSR
     DN}{CRSR LF}{CTRL 0}{SHFT LB.}":RETURN
459 PRINT"{HOME}"TAB(238)"{CTRL 9} {CRSR DN}{CRSR LF} {
     CRSR DN}{CRSR LF} {CRSR DN}{CRSR LF}.{CRSR DN}{CRS
     R LF} {CRSR DN}{CRSR LF} {CRSR DN}{CRSR LF} {CRSR
     DN}{CRSR LF}{CTRL 0}{COMD *}":RETURN
461 PRINT"{HOME}"TAB(183);:GOTO467
463 PRINT"{HOME}"TAB(179);:GOTO467
465 PRINT"{HOME}"TAB(187);
467 PRINT"{COMD J}{CRSR DN}{2 CRSR LFs}{CTRL 9}{COMD K}
     {CTRL 0}{COMD K}{CRSR DN}{2 CRSR LFs}{COMD L}{CRSR
      DN}{CRSR LF}{COMD L}{COMD K}":RETURN
469 PRINT"{HOME}"TAB(191);:GOTO467
471 PRINT"{HOME}"TAB(195);:GOTO467
473 PRINT"{HOME}"TAB(113);:GOTO479
475 PRINT"{HOME}"TAB(119);:GOTO479
477 PRINT"{HOME}"TAB(126);
479 PRINT"{SHFT O}{SHFT P}{CRSR DN}{2 CRSR LFs}{SHFT M}
     {COMD M}{CRSR DN}{2 CRSR LFs}{2 COMD Ms}{CRSR DN}{
     2 CRSR LFs}{2 COMD Ms}{SHFT P}{CRSR DN}{2 CRSR LFs
     }{SHFT O}{SHFT P}{CRSR DN}{3 CRSR LFs}{SHFT O} {SH
     FT N}";
480 PRINT"{CRSR DN}{3 CRSR LFs}{COMD G}{COMD M}{CRSR DN
     }{2 CRSR LFs}{COMD G}{COMD M}{CRSR DN}{2 CRSR LFs}
     {COMD G}{COMD M}{SHFT P}{CRSR DN}{3 CRSR LFs}{SHFT
      L}{SHFT @}{SHFT P}":RETURN
481 PRINT"{HOME}"TAB(75)"{SHFT O}{COMD T}{SHFT P}{3 CRS
     R LFs}{CRSR DN}{COMD G} {COMD M}{CRSR DN}{3 CRSR L
     Fs}{COMD G} {COMD M}{CRSR DN}{3 CRSR LFs}{SHFT M}
     {COMD M}{CRSR DN}{2 CRSR LFs}{COMD G}{COMD M}";
482 PRINT"{CRSR DN}{2 CRSR LFs}{COMD G}{COMD M}{SHFT P}
     {CRSR DN}{3 CRSR LFs}{COMD G}{SHFT @}{SHFT P}{CRSR
      DN}{3 CRSR LFs}{2 COMD Gs}{COMD M}{CRSR DN}{3 CRS
     R LFs}{SHFT O} {SHFT N}{CRSR DN}{4 CRSR LFs}{SHFT
     O} {COMD M}"
483 PRINTTAB(9)"{COMD G} {COMD M}{CRSR DN}{3 CRSR LFs}{
     COMD G} {COMD M}{CRSR DN}{3 CRSR LFs}{COMD G} {COM
     D M}{SHFT P}";
484 PRINT"{CRSR DN}{4 CRSR LFs}{COMD G} {COMD M}{SHFT P
     }{CRSR DN}{4 CRSR LFs}{SHFT L}{COMD @}{2 SHFT @s}"
     :RETURN
485 PRINT"{HOME}{2 CRSR RTs}{SHFT M}{7 SPACEs}{COMD M}"
     :FORI=1TO14:PRINT"{3 CRSR RTs}{COMD G}{6 SPACEs}{C
     OMD M}":NEXTI
487 PRINT"{3 CRSR RTs}{COMD G}{6 SPACEs}{COMD M}{SHFT O
     }{3 COMD Ts}{SHFT P}":FORI=1TO3:PRINT"{3 CRSR RTs}
     {COMD G}{6 SPACEs}{COMD M}{COMD G}{3 SPACEs}{COMD
     M}":NEXTI
489 PRINT"{3 CRSR RTs}{COMD G}{5 SPACEs} {SHFT O}{5 COM
     D Ts}{SHFT P}"
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Listing 1 continued.

```
491 J=INT(RND(B)*100+1)
492 IFJ<11THENPRINT"{HOME}{4 CRSR RTs}{5 CRSR DNs}FRODO
     {CRSR DN}{5 CRSR LFs}LIVES{3 CRSR DNs}{4 CRSR LFs}
     J.S."
493 RETURN
499 POKE36879,59:K=1:PRINT"{SHFT CLR}":FORI=0TO20:PRINT
     "":FORJ=0TO20
500 IFK=1THENK=0:PRINT"{CTRL 7}";:GOTO503
501 K=1:PRINT"{CTRL 5}";
503 PRINT"{CTRL 9} ";:NEXTJ,I:PRINT"{HOME}":RETURN
504 GOSUB499:PRINT"{HOME}DRAWING "N$
505 FORI=0TO20:FORJ=0TO20:POKE4140+I+J*22,M%(I,J):NEXTJ
     ,I
507 PRINT"{HOME}{CTRL 1}":GOSUB627:GOTO513
509 POKE36879,8:RETURN
511 REM DUMMY CSR
513 IFP<0ORP>20ORQ<0ORQ>20THENJ=0:I=0:GOTO517
515 J=Q:I=P*22:F=PEEK(4140+I+J)
517 J=Q:I=P*22:F=PEEK(4140+I+J):POKE4140+I+J,42:I1=0:N=
     0
519 I1=0:N=0
521 GETA$:IFA$=""THEN521
523 IFA$="{CRSR UP}"ANDI>0THEN:I1=-22:GOSUB577:GOTO519
525 IFA$="{CRSR DN}"ANDI<440THENI1=22:GOSUB577:GOTO519
527 IFA$="{CRSR LF}"ANDJ>0THENN=-1:GOSUB577:GOTO519
529 IFA$="{CRSR RT}"ANDJ<20THENN=1:GOSUB577:GOTO519
531 IFA$="*"THENPOKE4140+I+J,F:P=I/22:Q=J:PRINT"{CTRL 2
     }":GOTO509
533 IFA$="1"THENF=247:GOTO575
535 IFA$="2"THENF=244:GOTO575
537 IFA$="5"THENF=215:GOTO575
539 IFA$="3"THENF=239:GOTO575
541 IFA$="4"THENF=234:GOTO575
543 IFA$="{SPACE}"THENF=160:GOTO575
545 IFA$="6"THENF=241:GOTO575
547 IFA$="0"THENF=137:GOTO575
549 IFA$="7"THENF=243:GOTO575
551 IFA$="8"THENF=242:GOTO575
553 IFA$="Q"THENF=204:GOTO575
555 IFA$="W"THENF=207:GOTO575
557 IFA$="X"THENF=214:GOTO575
559 IFA$="E"THENF=208:GOTO575
561 IFA$="R"THENF=250:GOTO575
563 IFA$="9"THENF=235:GOTO575
565 IFA$="N"THEN649
567 IFA$="{FUNCT 1}"THENG=G+1:GOSUB625:GOTO521
569 IFA$="S"THENGOSUB585:GOTO504
571 IFA$="L"THENGOSUB591:GOTO507
573 GOTO521
575 M%(J,I/22)=F:POKE4140+I+J,F:GOTO519
577 POKE4140+I+J,F:I=I+I1:J=J+N:F=PEEK(4140+I+J):POKE41
     40+I+J,42:RETURN
579 PRINT"{HOME}{CTRL 1}ARE YOU SURE?{29 SPACEs}"
581 GETA$:IFA$=""THEN581
583 RETURN
585 GOSUB579:IFA$<>"Y"THENRETURN
587 K=0:OPEN1,1,1,N$:PRINT#1,N$:FORI=0TO20:FORJ=0TO20:P
     RINT#1,CHR$(M%(I,J));:K=K+1
589 PRINT"{HOME}"TAB(22)K:NEXTJ,I:CLOSE1:RETURN
591 GOSUB579:IFA$<>"Y"THENRETURN
593 PRINT"{HOME}";:K=0:OPEN1,1,0,"":INPUT#1,N$:PRINT"{S
     HFT CLR}DRAWING "N$:FORJ=0TO20:PRINT""
595 FORI=0TO20:IFK=1THENK=0:PRINT"{CTRL 7}";:GOTO599
597 K=1:PRINT"{CTRL 5}";
599 PRINT"{CTRL 9}{SPACE}";:NEXTI,J:PRINT"{HOME}":K=0:F
     ORI=0TO20:FORJ=0TO20:GET#1,A$:A=ASC(A$)
601 B=A-INT(A/1000)*1000
602 IFB=137ORB=247ORB=244ORB=234ORB=215ORB=214ORB=241OR
     B=243THEN623
603 IFB=242ORB=235ORB=204ORB=207ORB=208ORB=250ORB=160TH
     EN623
605 IFB=213ORB=240THENB=207:GOTO623
607 IFB=200ORB=217ORB=231ORB=234ORB=246THENB=234:GOTO62
     3
609 IFB=201ORB=238THENB=208:GOTO623
611 IFB=202ORB=237THENB=204:GOTO623
613 IFB=203ORB=253THENB=250:GOTO623
615 IFB=196ORB=197ORB=227ORB=247ORB=248THENB=247:GOTO62
     3
617 IFB=198ORB=210ORB=226ORB=228ORB=239ORB=249THENB=239
     :GOTO623
618 IFB=176ORB=143ORB=209THENB=215:GOTO623
619 IFB=199ORB=212ORB=225ORB=229ORB=244ORB=245THENB=244
     :GOTO623
620 IFB=152THENB=214:GOTO623
621 IFB>128THENB=B-128
623 M%(I,J)=B:POKE4140+I+J*22,B:NEXTJ,I:CLOSE1:RETURN
625 IFG>8THENG=1
627 ONGGOTO639,629,631,635,633,637,641,643
629 PRINT"{HOME}WALL 1={COMD U},2={COMD J},3={COMD O},4
     ={COMD J}{2 SPACEs}":RETURN
631 PRINT"{HOME}DOOR 6={COMD E},7={COMD W},8={COMD R},9
     ={COMD Q}{2 SPACEs}":RETURN
633 PRINT"{HOME}PIT 5={SHFT W},STAIR 0=I,X={SHFT V} ":R
     ETURN
635 PRINT"{HOME}CORNER Q={SHFT L},W={SHFT O},E={SHFT P}
     ,R={SHFT @}":RETURN
637 PRINT"{HOME}S=SAVE, L=LOAD{8 SPACEs}":RETURN
639 PRINT"{HOME}{CTRL 1}PUSH {CTRL 9}F1{CTRL 0} FOR COD
     ES{4 SPACEs}":RETURN
```

More

Listing 1 continued.

```
641 PRINT"{HOME}3D{LEFT ARROW}MAP & MAP{LEFT ARROW}3D =
      *{3 SPACEs}":RETURN
643 PRINT"{HOME}N=ERASE MAP AND BOARD ":RETURN
645 FORI=1TO15:R=INT(RND(G)*DC+1):PRINT"{HOME}{2 [CRSR
      RT]s}DIE ROLL{5 SPACEs}":PRINT"{HOME}{2 [CRSR RT]s
      }DIE ROLL"R
647 FORJ=1TO50:NEXTJ,I:RETURN
649 GOSUB579:IFA$<>"Y"THENGOSUB627:GOTO567
651 PRINT"{SHFT CLR}NEW MAP NAME":INPUTN$:FORI=0TO20:FO
      RJ=0TO20
652 M%(I,J)=160:NEXTJ,I:GOSUB499:GOTO507
653 GOSUB627:GOTO567
655 I=E%(3,1):IFI=247ORI=241ORI=32ORI=207ORI=208THEN663
657 I=E%(3,2):IFI=239ORI=242ORI=250ORI=204THEN663
659 I=E%(3,2):IFI=214THEN663
661 Q=Q+Z:P=P+Y:GOTO9
663 PRINT"{HOME}{3 [CRSR RT]s}AGAINST{[CRSR RT]}WALL":F
      ORI=1TO900:NEXTI:PRINT"{HOME}{3 [CRSR RT]s}
      {[CRSR RT]}      ":GOTO161
665 FORI=1TO30:NEXTI:RETURN
667 PRINT"{2 SPACEs}{COMD G}{16 SPACEs}{COMD M}":RETURN
669 POKE36866,PEEK(36866)AND128ORI:RETURN
671 PRINTTAB(15)K:RETURN
```

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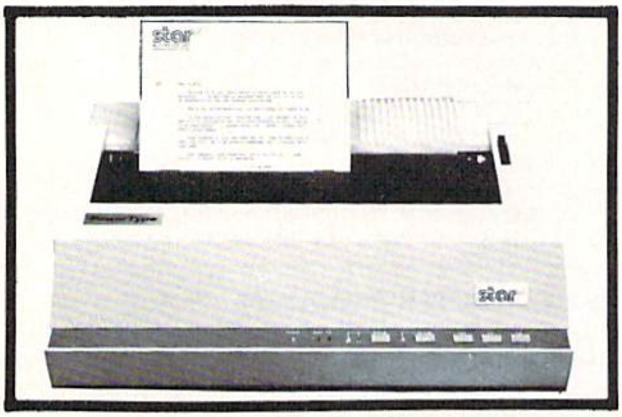

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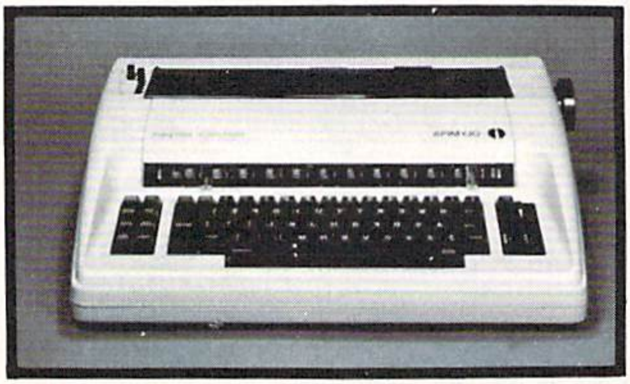

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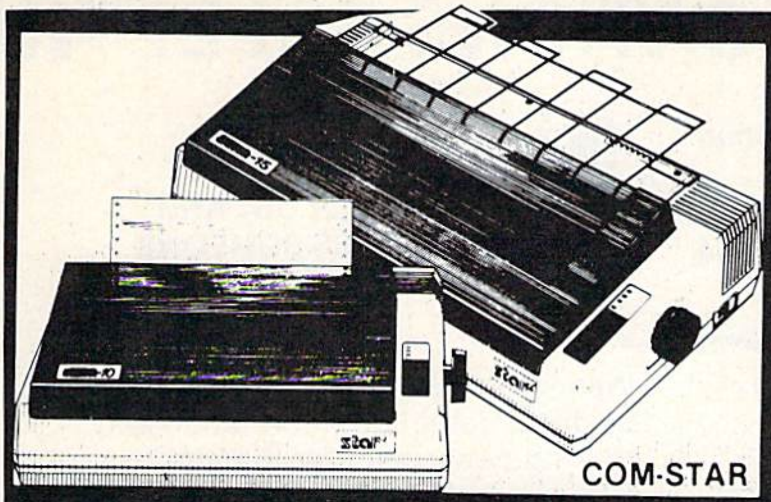

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Mix and Match Programs On the Commodore 64

This disk utility program makes combining your Basic programs almost as easy as shuffling cards.

By John Olsen

Have you ever wanted to combine two Basic programs, or maybe add some commonly used subroutines to a program you're writing? When you combine like this, you are either *appending* or *merging* programs. Appending means adding one program to the end of another, while merging actually interweaves the program lines. See Fig. 1 for the distinction.

Appending programs on the Commodore 64 is relatively simple—merely a matter of a few Peeks and Pokes. I'll describe the method at the end of this article. Merging programs, on the other hand, is something the C-64 doesn't readily do.

Merge is a program written to make the job easy. When run, it loads two programs from disk into an array in memory. It then writes a single program back to the disk, with the program lines merged in proper order.

In case both programs have a line with the same number, the line in the original program is used, and the one in the second program is discarded. (If you wish to reverse this, simply change the statement Z =P1 in line 5000 to Z = P2.)

The C-64's memory is large enough to hold two programs with a combined total of 500 program lines, assuming nearly all those lines contain the maximum of 80 characters. Actually, most programs have many lines of much fewer than 80 characters, so the line total could easily be increased. To do so, change the Dimension statement in line 100. The worst that can happen is that the program will report a run-time error. If that happens, simply lower the limits in line 100 and run Merge again.

If you merely want to use Merge and don't care why it works, type it into your computer and read no further. The rest of the article explains how a Basic program is recorded on disk, how it can be uncoded, read into an array in memory, and then merged with another program and written back to disk.

RUN It Right

Commodore 64
1541 disk drive

Address author correspondence to John R. Olsen Jr., PO Box 181, Newberg, OR 97132.

Tokenizing Basic

Basic programs are saved on disk in tokenized form, which reduces the space they occupy. For example, the program line 5000 PRINT X takes twelve characters, including the spaces. Tokenized on disk, it takes up only five bytes. Regard each byte as a single number from 1 to 255. In tokenized form, the line above would consist of the five bytes 136, 19, 153, 32 and 88. The 136 and 19 make up the line number 5000 (each line number is made up of two bytes). To change it to the decimal number 5000, multiply the second byte by 256 and add the first byte to the result.

The third byte of 153 is the token for the Print command. This illustrates the most obvious advantage of tokenizing. The fourth byte, 32, represents the space between PRINT and X, and the final byte of 88 represents the X. Notice that because the computer will always put a space between the line number and the statement, it doesn't need to include that space in the tokens.

I hope you aren't lost yet, because there are a few more things you need to know about how a program is saved on disk before you can understand the listing of Merge.

Every tokenized line is followed by a byte of 0 to indicate the end of that line, and is preceded by two bytes that indicate into which memory location the *next* program line should be loaded. So

Program 1	10 PRINT “one” 20 PRINT “one” 30 PRINT “one”	appended	10 PRINT “one” 20 PRINT “one” 30 PRINT “one” 60 PRINT “two” 70 PRINT “two” 80 PRINT “two”
Program 2	60 PRINT “two” 70 PRINT “two” 80 PRINT “two”		
Program 1	10 PRINT “one” 20 PRINT “one” 30 PRINT “one”	merged	10 PRINT “one” 15 PRINT “two” 20 PRINT “one” 25 PRINT “two” 30 PRINT “one” 35 PRINT “two”
Program 2	15 PRINT “two” 25 PRINT “two” 35 PRINT “two”		

Fig. 1. Difference between appending and merging two programs.

each program line consists of a two-byte address for the next program line, the current line in token form, and a zero.

The very first two bytes on the disk give the memory address at which to begin loading the program. All Basic programs start loading at 2049 (or, as two bytes: 1, 8). The very *last* two bytes of the program on the disk are both zeros. This tells the computer to stop loading the program. Fig. 2 shows the format of a Basic program as recorded on disk.

The Concept of Merge

The utility program Merge strips off the first two bytes (1, 8) of a program and throws them away. Then it loads the two-byte address for the next program line. (If these bytes are both zero, it knows it has finished loading the program.) *These* two bytes are then thrown away (different addresses will be needed in saving the merged program).

Merge then starts loading the program line into the A$ array in memory. The first two bytes of the program line are the line number. These are converted into a single decimal number and saved in the A array, which will be checked to see in which order to insert the lines when the programs are merged.

These same two line-number bytes are saved (unconverted) in the A$ array along with the rest of the program line. When the program reaches a byte of zero, it knows that the program line has ended. So it moves down one element in the A$ array and starts loading the next program line. When the process is done, each program line resides in a separate element of the array.

The second program is then similarly loaded into the same arrays. The computer remembers the point in each array where the first program ends and the next one starts. After the second program is loaded into memory, the computer will merge the two programs as it saves the new version back on disk.

To do the actual merging, the computer only has to check the A array for the line numbers, then save the corresponding element in the A$ array onto disk. In any case of duplicate line numbers, Merge saves the line from the original program and discards the one from the second. But you must be sure, before saving the current line, to save a two-byte memory address in which to load the *next* line.

When the entire merged program is saved on disk, finish it off by writing two zero bytes to signal the end of the program.

Merge Program Details

Now let's run through the listing of Merge and examine each section of the program.

Line 100 creates room for 500 line numbers in the A array, and room for 500 program lines in the A$ array. The N$ array is for the names of the two programs to be loaded.

Line 110 sets the variable MP (the memory pointer) to 2049, where the final merged program will eventually be loaded into memory, and this number must be on the disk. The value of MP will also increase with each line saved to disk, so that the load address will be correct at the beginning of each program line on the disk.

The lines in the 500s get the names of the two programs to be merged and the name of the resultant program. By defining S$ to be the same as the name of the original program (in line 530), you now can simply press the return key when asked “Save under what name?”, and it will be saved under the name of the original program. Or you can type a new name if desired.

The lines in the 1000s open the command channel to the disk drive and initialize the drive.

The lines in the 2000s simply take the first program and load it into the arrays. The statement X = 0 refers to the name of the first program, N$(0). Then it goes to the subroutine at 6000 to load

1	8	memory address at which to begin loading a Basic program	
X	X	tokenized program line	0
X	X	tokenized program line	0
		”	
		”	
		”	
X	X	tokenized program line	0
0	0	indicates end of Basic program.	
X	X	indicates a two-byte memory address at which to begin loading the *next* program line.	

Fig 2. Format of a Basic program on disk.

the program. This subroutine will be explained later. Finally, the variable E1 is set to point to the end of the first program in the arrays.

The lines in the 3000s deal with loading the second program into the computer's arrays. First the variable P2 points to the first line of this second program in the array. The variable X refers to the name of the second program, N$(1).

Then we go to the same subroutine at 6000, which loads the second program into the arrays. And finally, the variable E2 points to the last line of the program in the arrays.

```
100 DIM A(500), A$(500), N$(1)
110 MP=2049
500 PRINT"{SHFT CLR}MERGE{CRSR DN}"
510 INPUT"NAME OF ORIGINAL PROGRAM";N$(0)
520 INPUT"NAME OF PROGRAM TO MERGE";N$(1)
530 S$=N$(0)
540 INPUT"{CRSR DN}SAVE UNDER WHAT NAME";S$
1000 OPEN 15,8,15
1010 PRINT#15,"I"
2000 X=0
2100 GOSUB 6000
2200 E1=P-1
3000 P2=P
3100 X=1
3200 GOSUB 6000
3300 E2=P-1
4000 PRINT "{CRSR DN}SAVING ";S$
4010 OPEN 2,8,2,"@0:"+S$+",P,W"
4020 GOSUB 8000
4030 PRINT#2,CHR$(1);CHR$(8);
5000 IF A(P2)=A(P1) THEN Z=P1:P1=P1+1:P2=P2+1:GOTO 5100

5010 IF A(P2)<A(P1) THEN Z=P2:P2=P2+1:GOTO 5100
5020 IF A(P2)>A(P1) THEN Z=P1:P1=P1+1
5100 MP=MP+LEN(A$(Z))+2
5110 X=INT(MP/256)
5120 Y=MP-256*X
5130 PRINT#2,CHR$(Y);CHR$(X);A$(Z);
5200 IF P1<E1 OR P2<E2 THEN 5000
5300 PRINT#2,CHR$(0);CHR$(0);
5310 CLOSE2
5320 CLOSE15
5330 END
6000 PRINT "{CRSR DN}LOADING ";N$(X)
6010 OPEN 2,8,2,"0:"+N$(X)+",P,R"
6020 GOSUB 8000
7000 GET#2,A$,B$
7010 GET#2,A$,B$
7020 IF A$="" AND B$="" THEN A(P)=65000:P=P+1:CLOSE2:RE
     TURN
7030 GET#2,A$
7040 IF A$="" THEN A$=CHR$(0)
7050 X=ASC(A$)
7060 A$(P)=A$
7070 GET#2,A$
7080 IF A$="" THEN A$=CHR$(0)
7090 A(P)=X+256*ASC(A$)
7100 A$(P)=A$(P)+A$
7110 GET#2,A$
7120 IF A$="" THEN A$=CHR$(0)
7130 A$(P)=A$(P)+A$
7140 IF A$<>CHR$(0) THEN7110
7150 P=P+1
7160 GOTO 7010
8000 INPUT#15, EN, EM$, ET, ES
8010 IF EN=0 THEN RETURN
8020 PRINT "DISK ERROR"
8030 PRINT EN; EM$; ET; ES
8040 CLOSE2
8050 CLOSE15
```

Listing of Merge program for the C-64.

So at this point, E1 points to the end of the first program, E2 points to the end of the second program, P1 points to the beginning of the first program (actually P1 has not been defined, so is 0 by default), and P2 points to the beginning of the second program.

The lines in the 4000s begin saving the merged program back to disk. The file is opened, a check for any disk errors is made by going to the subroutine at 8000, and the first two bytes are saved to disk. These bytes are the same for all Basic programs and indicate where to begin loading the program.

The lines in the 5000s save the merged program to disk. They merge the program on the run. That is to say, they choose the next program line to save and immediately save it. This is a much faster method than merging the two programs in memory by using a sort routine, and then saving the entire thing to disk at once.

Remember that P1 points to the first line of program 1, and P2 points to the first line of program 2. Line 5000 checks to see if the first line numbers are the same. If so, the line from program 1 takes priority. The pointers are moved to the next lines in both programs (skipping over the line in the second program that had a conflicting line number), and the line is saved to disk (the routine starting at 5100).

Line 5010 checks to see if the next program line in program 2 is less than the one in program 1. If so, it moves the pointer down one for program 2 and saves the line onto the disk. If the program line in program 2 is greater than the one in program 1, then line 5020 moves the pointer for program 1 down one, and the line from program 1 is saved on disk.

Line 5100 moves the memory pointer P the length of the program line, plus two more bytes for the load address. Lines 5110 and 5120 convert the memory pointer into a two-byte load address. Finally, line 5130 saves the load address plus the program line onto the disk.

Line 5200 checks to see if all the lines from both program 1 and program 2 have been saved. If not, it goes back and keeps comparing and saving lines. If all lines are done, line 5300 saves the last two bytes, both zeroes. Then both files are closed and the program ends.

The lines starting at 6000 were mentioned earlier. They load a program into the arrays. The first few lines open the file to be read and check the error channel for disk errors (subroutine at 8000).

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Then, starting with line 7000, each program is read from disk into the two arrays in memory. Line 7000 gets the first two bytes of the program. These are always 1 and 8 (2049 in a single decimal number); they indicate where in memory the program should start loading, and are not saved in any array.

Lines 7010 and 7020 check the next two bytes to see if both are zeroes. If they are, this indicates the end of the program. If not, the program will be read into memory byte by byte. In either case, these two bytes are not saved in any array. They are load addresses, which will be different when you save the merged program back onto the disk.

If line 7020 finds that both bytes are zeroes, then it saves a program line number of 65000 in the A array, and the pointer is incremented. The file is then closed and the subroutine ended.

The reason for saving 65000 is that you need a line number bigger than any other that's possible in order to check the end of the array. Without it, the routines in lines 5000–5020 would move from the last line of program 1 into the first line of program 2.

Starting with line 7030, the program line is actually read into the A$ array and its line number is saved in the A array. First it gets one byte. If this was a zero on disk, the Get# command will interpret this as a null string. You don't want this, so line 7040 fixes it by putting it back to zero again.

> *To append one program to another, you only need to make a few Peeks and Pokes.*

The first byte is saved in X as well as put into the A$ array. The second byte is read in and combined with X to create a line number in normal decimal form. The result is saved in the A array. This byte is also added to the A$ array.

Lines 7110–7140 read in the rest of the bytes and add them to the A$ array. Reading a zero indicates the end of that particular program line. The pointer for the arrays is moved down one and the program goes back to line 7010 to start getting the next line.

The lines in the 8000s are the disk error subroutine. This is a standard routine found in many programs. It reads the error channel and reports any error. If the error number EN is zero, then there was no error, and the routine returns. Otherwise, the error is printed out, and the files are closed.

With a few minor changes, this program could be modified to work from cassette instead of disk. That, however, I will leave for you to experiment with. Good luck.

Appending a Program

Merge can also be used to append one program to another, where the line numbers of the second one all exceed the highest line number of the first. However, this is rather a slow method; there is a much faster one.

The secret of appending programs lies in four memory locations. Locations 43 and 44 point to where your Basic program starts, while locations 45 and 46 point to where it ends (if you subtract 2). So to append one program to another, you need only make a few Peeks and Pokes. It will save a lot of time!

In general, load your first program (the one with the lower line numbers) and move the beginning of the program pointer to the end of your program. Then load the second program (the one with the greater line numbers). Finally, move the pointer back where it belongs. That's it.

Keep in mind that the pointers are written in two bytes. To convert them to normal decimal numbers, you need to multiply the second byte by 256 and add the first byte. To convert them back to two bytes, you divide the decimal number by 256. The integer part of the answer is the second byte. The remainder is the first byte.

For example: if you Peeked into 43 and 44, you'd probably see a 1 and an 8. You'd multiply 256 by 8 and get 2048. Add the 1 and get 2049. To change the 2049 back to two bytes, you divide 2049 by 256 and get 8, with a remainder of 1. Be sure to get the bytes in the proper order of 1, 8.

So to append two programs, load your first one into the computer's memory. Peek into memory locations 45 and 46, convert what you find to a decimal number as shown above and subtract two from the result. As shown above, convert this back to two bytes and Poke the results into locations 43 and 44. Then load your second program and Poke 43 and 44 with 1 and 8, respectively. That completes the task. R

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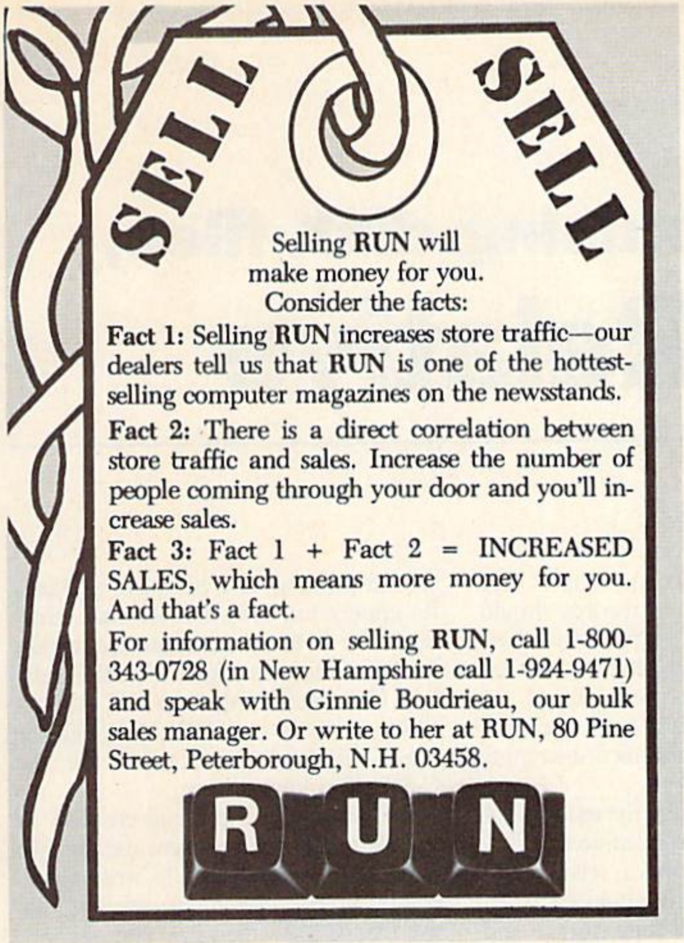

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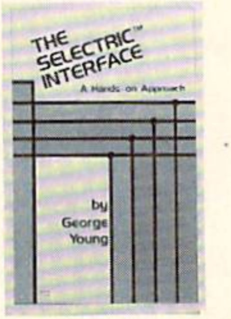

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When it comes to using disk files,

It's All Relative

Sometimes a user's manual is more of a hindrance than a help in learning how to get the most out of your computing system. That's when articles such as this one on relative files come in so handy to cut through the obstacle course presented by "vague," "error-filled," "misleading" manuals.

By David R. Brooks

RUN It Right
VIC-20 or C-64
1541 disk drive

Address author correspondence to David R. Brooks, 805 Cockletown Road, Yorktown, VA 23692.

Efficient computer programs for managing accounts and records should have a structure that allows easy examination, addition and alteration of all information that has been stored. In short, they should be at least as convenient to use as manual record-keeping systems.

Such programs require the use of what are generally called random-access files. On Commodore machines, relative files are one class of random-access files. They aren't suited for tape storage and manipulation, so their use presumes the availability of a disk drive like the Commodore 1541.

Although it's obvious that computerized record keeping should be at least as handy and reliable as a file cabinet, you may lose sight of this in the face of the effort required to understand and use relative files. They're described, although poorly, in the *VIC-1541 User's Manual*, which is vague, full of errors and sometimes so misleading that it presents more of an obstacle course than a guide to disk file usage.

Reading it is nevertheless a good idea if you don't take the details too seriously. It does list the file types and various commands, and gives you some idea of what you can do with the 1541. I hope this article will remove some of the obstacles to using your disk drive and will encourage you to write your own record-managing programs. There are specific techniques to learn, but if you've done even a little Basic programming, the examples I'll give should enable you to use relative files on your own.

Getting Started

I'm going to discuss two Basic programs, one that creates blank relative files with specific properties and another that uses a relative file system to keep track of computer expenses. The second program is a complete and useful application as is, but its main function here is to demonstrate techniques for accessing, reading and writing relative files. Both programs will run on either a VIC-20 or a C-64, although the screen displays are intended for the C-64's 40-column screen.

I've separated the initial creation of the file from its subsequent use for two reasons. First, it's useful to write a general-purpose program for creating relative files of a specified size, and, second, the Basic command for opening a file when it's first being created is slightly different from the command for opening it when you use it later.

There's really no advantage to combining these two functions in the same program. You'll need to create the file only once, but the program for accessing the file will be altered and used many times.

Before discussing either of the programs, let's consider the requirements for a program to keep track of computer expenses. You'll want to store the date and amount of the purchase and a description of the item. Of course, you'll want to be able to examine all the entries. You'd like to be able to add new expenses and alter old records. (Suppose, for example, you decided later on to add the serial number of hardware to its description.)

The simplest way to set up relative files is as strings of characters. By using Basic string functions, you can control the exact pattern of characters to be stored on the file.

This control can be applied as easily to numbers as to text. In fact, you can make the computer treat *all* data like characters. This is reasonable because record-managing programs usually involve very little numerical calculation.

Your first programming task is to

think about how much space (how many characters) it will take to store the information you want for each transaction. For each item, you must decide the *maximum* number of characters you'll need to express the information.

For instance, the date might be 11/10/83. That's eight characters. How many characters to name the item? Let's say 20. How about cost? Maybe no more than 9999.99; you don't need to include the dollar sign on the file. Then say you allow another 40 characters for additional notes. That's a total of 75 characters.

There's no reason to be stingy with space at this point. You can easily change the arrangement and contents of a relative file, but once you've set the maximum size of records on the file, you're stuck with that total number of characters per record.

Eighty characters should be plenty for all the information you'll want to store about each purchase. (Depending on how data is written to the file, you'll need a few more than the total of 75 I just counted.) Now I'll show you how to create the file, or at least its skeleton.

Creating the Relative File

I'm going to discuss the program Open Rel File (see Listing 1) in detail because all the techniques covered now will carry over to applications programs. Before you try to use this program, you should load and run the C-64 or VIC-20 Wedge that is on your 1541 Test/Demo disk. It will give you some simple commands for regaining control of your system if you have disk problems (see p. 14 of the 1541 user's manual).

Here's some analysis of the significant program statements in Open Rel File.

Line 30: Input the name of the file, which will be truncated by the system to no more than 16 characters. It's used to identify your data file on the disk you insert in the disk drive.

Line 35: Input the file/channel number. You can think of the file number as identifying an area in the memory of the 1541's Disk Operating System (DOS) that will be reserved for managing the flow of data and commands between your data file and the computer.

The channel number identifies a particular communication link between the computer and the DOS. The file number can range from 1 to 127, and the channel number from 2 to 14 (see the user's manual, pp. 14–15). The file and channel number can be the same, so that's what I've done.

Since I've reserved file number 1 for something else (see statement 90), the Input prompt asks for a file/channel number from 2 to 14. When you use files created by the program, you can assign whatever file and channel number you want. They're used only by the DOS, and don't appear anywhere on your physical data file. Does it seem that specifying *both* a file and a channel number shouldn't be necessary? Well, it does to me, but that's a quirk of the system you have to work with.

Line 65: Input the number of data records and the number of characters per record. Recall that the purpose of Open Rel File is to create blank data records. There's a reason for this, involving the speed of subsequent operations with the file. However, you can always add more records at any time, just by writing past the end of whatever file you establish now.

So, you should allow yourself a reasonable number of records for your application, but don't worry about underestimating your ultimate needs. The maximum I've specified, 700, is close to the disk limit, and is actually more than this disk drive can conveniently handle.

The character count for each record should include one extra character for a Return that the DOS normally puts at the end of each record. The maximum allowed number of characters, including the Return, is 254. You should take

```
5 REM NAME "OPEN REL FILE", AUG83
10 REM OPENS A RELATIVE FILE. ASKS FOR FILE NAME,
11 REM FILE/CHANNEL,# OF DATA RECORDS AND CHARACTERS
13 REM PER RECORD. FILE NAMES ARE TRUNCATED TO 16
14 REM CHARACTERS. THE 1ST RECORD IS RESERVED FOR A
15 REM COUNTER WHICH WILL SERVE AS AN INDICATOR OF HOW
17 REM MANY DATA RECORDS HAVE BEEN WRITTEN WHEN THE
18 REM FILE IS USED LATER. THE LAST
19 REM RECORD CONTAINS THE WORD "END".
25 PRINT"{SHFT CLR}RELATIVE FILE CREATOR":PRINT
30 INPUT"FILE NAME";N$
32 PRINT"NOTE: FILE NAMES TRUNCATED TO 16 CHAR"
33 IFLEN(N$)>16THENN$=LEFT$(N$,16)
35 INPUT"FILE/CHANNEL# <2-14>";W
40 IFW<2 OR W>14 THEN 35
65 INPUT"MAX # DATA RECS, CHARS";R,C
70 IFR<1THENPRINT"# RECS MUST BE >0":GOTO65
80 IFC<1THENPRINT"# CHARS MUST BE >0":GOTO65
90 OPEN1,8,15:SN=90:OPENW,8,W,N$+",L,"+CHR$(C):GOSUB900

95 PRINT"I HAVE OPENED A RELATIVE FILE."
96 PRINT"ITS NAME IS ";N$
97 PRINT"IT HAS ";C;" CHARACTERS PER RECORD"
100 R1=R+2:R2=0:IFR1>255THENR2=INT(R1/256):R1=R1-256*R2
120 SN=120:PRINT#W,"0":GOSUB900
125 SN=125:PRINT#1,"P"CHR$(W)CHR$(1)CHR$(0)CHR$(1):GOSU
    B900
130 SN=130:PRINT#1,"P"CHR$(W)CHR$(R1)CHR$(R2)CHR$(1):GO
    SUB900
134 SN=134:PRINT#W,"END":GOSUB900
135 PRINT"I'VE PUT A '0' IN THE FIRST RECORD"
136 PRINT"FOR YOU TO UPDATE AS A COUNTER WHEN"
137 PRINT"YOU WRITE RECORDS TO THIS FILE."
138 PRINT"THEN I'VE WRITTEN 'END' AFTER THE"
139 PRINT"LAST DATA RECORD."
150 SN=150:CLOSEW:GOSUB900:CLOSE1:STOP
900 INPUT#1,E,E$,T,S:IFE<20ORE=50THENRETURN
905 PRINT"DISK ERROR FROM SN";SN
910 PRINTE;E$;T;S:CLOSEW:CLOSE1:STOP
915 RETURN
1000 INPUT"FILE NAME";N$:INPUT"NUMBER OF RECORDS";R
1010 W=2:OPEN1,8,15:SN=1010:OPENW,8,W,N$:GOSUB900
1020 FORI=1TOR+2:R1=I
1030 R2=0:IFR1>255THENR2=INT(R1/256):R1=R1-256*R2
1040 SN=1040:PRINT#1,"P"CHR$(W)CHR$(R1)CHR$(R2)CHR$(1):
     GOSUB900
1050 SN=1050:INPUT#W,Z$:GOSUB900:PRINTI;Z$:NEXT
1060 SN=1060:CLOSEW:GOSUB900:CLOSE1:END

READY.
```

Listing 1. Open Relative File program.

care to make the character count for each record sufficient to handle *all* the data you'll input, for if you want to expand the size of records in the future, you'll have to create a new file. That's easy enough, as long as you decide to do it before you've already typed in so many records that you can't bear the thought of starting over!

Line 90: OPEN 1,8,15 opens and assigns the disk command channel. This Open statement contains the same parameters as for opening data files, but it doesn't involve files in the usual sense.

The first parameter is the file number. It can have any allowed value except the one assigned to your data file, but I've reserved the number 1 for this purpose in all my file programs. The disk drive device number is normally 8, and there's no reason to change it unless you have more than one disk drive. The third parameter is the channel number. Because it's number 15, the channel reserved for disk commands, this Open only initiates a communication link between the computer and the DOS; it never operates directly on a disk file.

This "file" is used for transmitting subsequent disk commands and error messages back and forth between the computer and the disk drive. Hence, it should *always* be the first disk command in any program. OPEN W,8,W, N$+",L,"+CHR$(C) opens and assigns your data file with the file/channel number, name and character count you previously input. Now you're ready to read and write data on the disk. The syntax for this command is hard to remember, but if you use this program, you'll never have to worry about it again!

As long as a data file is open, the red light on the 1541 will be on. A blinking light indicates that an error has been detected. The manual writers allege that removing a disk when the red light is on or blinking may destroy data. This is one time I'd take their word for it! If your program crashes, leaving the red light on, you should regain control of the system as described below in the discussion of disk error checking. GOSUB900 checks for disk errors when the file is opened (see line 900, below).

Line 100: Calculate parameters for positioning the disk to a record just past the end of the data records. (Although I've let most of the errors in the 1541 user's manual go by without specific comment, I can't help pointing out that the formula given in statement 220 of the program on p. 36 for determining the low and high bytes of the record number is wrong. It's a small point that wouldn't cause any trouble until you tried to write the 256th record, but the text should read IF R1>255, *not* IF R1>256.)

Line 120: Write a zero in the first record. This is the first command that actually changes or reads the contents of your data file. The zero will be replaced in later programs as you write data on the file.

Line 125: Position the disk. The essential requirement for random-access files is the ability to locate any character of any record from wherever you happen to be in the file at the time. For Commodore relative files this feature is implemented with PRINT#1, where 1 is the number set aside for the command file. However, PRINT#1 acts on your *data* file through channel number N, as specified from your input.

Don't remove a disk
when the red light
is on or blinking.
Take the manual writer's
word for it!

The general format for specifying disk-positioning information is CHR$(R0)CHR$(R1)CHR$(R2)CHR$(R3), where R0 is the channel number, R1 and R2 are the "low" and "high" bytes of the record number, and R3 is the byte number in the record. Two numbers are needed to specify the record number because there's room on the disk for more than 255 records, but 255 is the largest number that will fit in one byte.

The formula for computing R1 and R2 for any given record is given in statement 100. Note that if R1 is initially a number greater than 255, it is replaced by the low byte value after R2 is calculated. So if you intend to use this value for something else, beware.

Line 130: Position the disk to the next record after the last data record. The interesting thing about using the positioning command here is that it forces the DOS to create all the intermediate records. This, as I mentioned previously, is the operation that will speed up subsequent use of the file.

Line 134: Write an "END" on the file. This isn't really required, but I've done it so you'll be able to look at the file once you've created it and see just what's there, including this little message at the very end. This "END" doesn't prevent you from making the file longer in the future; you just write a new record here and keep going.

Line 150: Finish the program by closing the files. The command channel should always be closed last, so the error-checking subroutine can continue to monitor the status of the data file until it's successfully closed.

Line 900: Check for disk errors. One of the most important considerations in using disk files is proper error checking. It's inevitable that at some point your programs will crash and the disk drive will hang up. My own experience is that you can always recover from such disasters by checking for disk errors immediately after *every* disk operation.

The command file opened on channel 15 is the means for transmitting error messages from the DOS. Once an error has been detected by the subroutine at line 900, the program will terminate, and you can regain control of the system by performing any legitimate disk operation.

Assuming that you've run the C-64 or VIC-20 Wedge, you can look at the status of the command channel by typing @[RETURN]. You can (and should) always regain control by typing @I[RETURN]. Regaining control means that the DOS will be forced to a safe condition, so your file contents won't be damaged. This includes closing the file so the red light on the disk drive will go off.

The subroutine checks the error channel for the error number E, error message E$, and the track and sector numbers E1 and E2 at which the error was detected. The last two values aren't of much interest for relative file use. Numbers less than 20 aren't disk error numbers, so they're ignored (see p. 43 in the user's manual).

Error number 50, Record Not Present, is not necessarily an error when you work with relative files. It means only that the program has positioned itself past the end of the file you've created. You shouldn't try to read data in this case, but you don't want to be bothered with printing this as an error message every time you write a new record.

My own convention for error checking includes passing through variable SN the statement number that calls the subroutine. Then I'll always know where in my program the error occurred. (Be careful if you renumber your program lines!) This subroutine may seem like a lot of trouble, but I urge you to go

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Listing 2. Computer Cost program.

```
1 REM PROGRAM NAME "COMPUTER COST"
2 REM DAVID R. BROOKS,
5 PRINTCHR$(14):F=80
10 POKE53280,0:POKE53281,0
20 OPEN1,8,15:SN=20:OPEN2,8,2,"COMPDATA":GOSUB900:R0=2
30 PRINT"{SHFT CLR}{4 SPACEs}**** {SHFT C}OMPUTER {SHFT
     C}OST {SHFT R}ECORDS ****"
40 PRINT:PRINT"{SHFT O}PTIONS:":PRINT
41 PRINT"1 {SHFT L}IST ALL RECORDS WITH TOTAL"
42 PRINT"2 {SHFT A}LTER RECORD(S)
43 PRINT"3 {SHFT A}DD NEW RECORD(S)
44 PRINT"4 {SHFT E}ND PROGRAM"
50 PRINT:INPUT"{SHFT O}PTION CHOICE";J
55 ONJGOTO60,60,60,500
60 R1=1:R3=1:SN=60:GOSUB920
70 SN=70:INPUT#2,N$:GOSUB900:N=VAL(N$)
105 ONJGOTO200,300,400,500
200 REM LIST ALL RECORDS AND TOTAL COST
202 T=0
209 GOSUB800
210 FORI=2TON+1
215 R1=I:R3=1:SN=215:GOSUB920
220 SN=220:INPUT#2,D$,ID$,C$,NO$:GOSUB900
222 C$=RIGHT$("{7 SPACEs}"+C$,7)
225 PRINTRIGHT$("{2 SPACEs}"+STR$(I-1),2);"{2 SPACEs}";
     D$;TAB(13);ID$;TAB(32);C$:T=T+VAL(C$)
226 PRINT"{4 SPACEs}";NO$
230 NEXT
231 PRINT"-------------------------------------------"
233 T$="$"+RIGHT$("{8 SPACEs}"+STR$(T),8)
234 PRINTTAB(18);"{SHFT T}OTAL COST: ";T$:PRINT
290 INPUT"{SHFT E}ND PROGRAM Y OR N";J$
292 IF J$="N"THEN40
294 GOTO500
300 REM ALTER RECORD(S)
315 PRINTN;" RECORDS WRITTEN"
320 INPUT"{SHFT A}LTER WHICHRECORD";WH
322 R1=WH+1:R3=1:SN=322:GOSUB920
322 R1=WH+1:R3=1:SN=322:GOSUB920
324 SN=324:INPUT#2,D$,ID$,C$,NO$:GOSUB900
325 PRINTD$;TAB(9);ID$;TAB(29);C$:PRINTNO$:SN=325:GOSUB
     920
328 PRINT:PRINT"{SHFT T}YPE IN CHANGES, RETURN FOR NO C
     HANGE."
330 GOSUB600:REM INPUT NEW DATA
338 PRINT"{SHFT N}EW RECORD IS:"
339 PRINTD$,ID$,C$:PRINTNO$
340 R1=WH+1:SN=340:GOSUB920
341 SN=341:S$=",":PRINT#2,D$;S$;ID$;S$;C$;S$;NO$:GOSUB9
     00
350 INPUT"{SHFT M}ORE UPDATES, Y OR N";M$:IFM$="Y"THENG
     OTO320
352 GOTO40
400 REM CREATE NEW RECORD(S)
410 PRINT"{SHFT N}EW RECORD WILL BE #";N+1
415 GOSUB600:REM INPUT NEW DATA
430 R1=N+2:R3=1:SN=430:GOSUB920
440 SN=440:S$=",":PRINT#2,D$;S$;ID$;S$;C$;S$;NO$:GOSUB9
     00
445 N=N+1
450 INPUT"{SHFT M}ORE RECORDS, Y OR N";M$:IFM$="Y"THENG
     OTO410
455 R1=1:R3=1:SN=455:GOSUB920
460 SN=460:PRINT#2,STR$(N):GOSUB900
465 GOTO40
500 REM END PROGRAM
510 CLOSE2:SN=510:GOSUB900:CLOSE1:END
600 REM INPUT DATA FOR ONE RECORD
601 INPUT"{SHFT D}ATE, DY/MO/YR";D$
602 PRINT"{SHFT D}ESCRIPTION, TO HERE."
603 PRINT"{SHFT D}ON'T USE COMMAS OR COLONS."
```

More

ahead and put it in every disk program.

Lines 1000–1060: Read the file. By typing RUN1000[RETURN], you can examine the file you just created. The program assigns 2 for the file/channel number. You should understand the positioning command now. R1 is set to the start of each data record in succession by the For...Next loop INPUT#W,Z$ reads what's in the record.

You might be surprised to see a π in the supposedly blank data records. It's put there by the DOS when it creates the record. When you write data records, your first character will replace the π.

So, that's it. Use this program to create a file named Compdata, with 25 records (this number doesn't really matter) and 80 characters per record (this one does). Now you're ready to use this file in a program.

Using a Relative File

Listing 2 displays my computer account program, Computer Cost. This program allows you to perform three basic record-managing functions: listing, adding and altering records. Once you understand how to use relative files here, you should be able to write your own applications. (In Part 3 of this series, I'll show you a more complicated example you can use for managing your bank account records.)

In serveral places, Computer Cost uses disk commands that have already been used and described in Open Rel File. I've tried not to duplicate that discussion.

Line 5: Clear screen. F is the maximum allowed record length for this file (see line 615).

Line 10: Change background and border to black. (Note: Delete this line for the VIC-20.)

Line 20: Open command channel and data file Compdata. Check for errors after every disk command. R0 is the channel number for positioning commands applied to the data file.

Line 40: Print a menu of available options. One option should always be to end the program properly by closing the data and command files. After going through any of the options except the last, you should always return to this point in the program so you can make additional choices.

Line 50: Input choice of options from menu. You might wish to add a test on J to make sure it's a number from 1 to 4.

Line 55: Close the disk files if option 4 is chosen.

Line 60: Set positioning parameters for the first byte of the first record. The actual disk positioning is done in the ircle 122 on Reader Service card.

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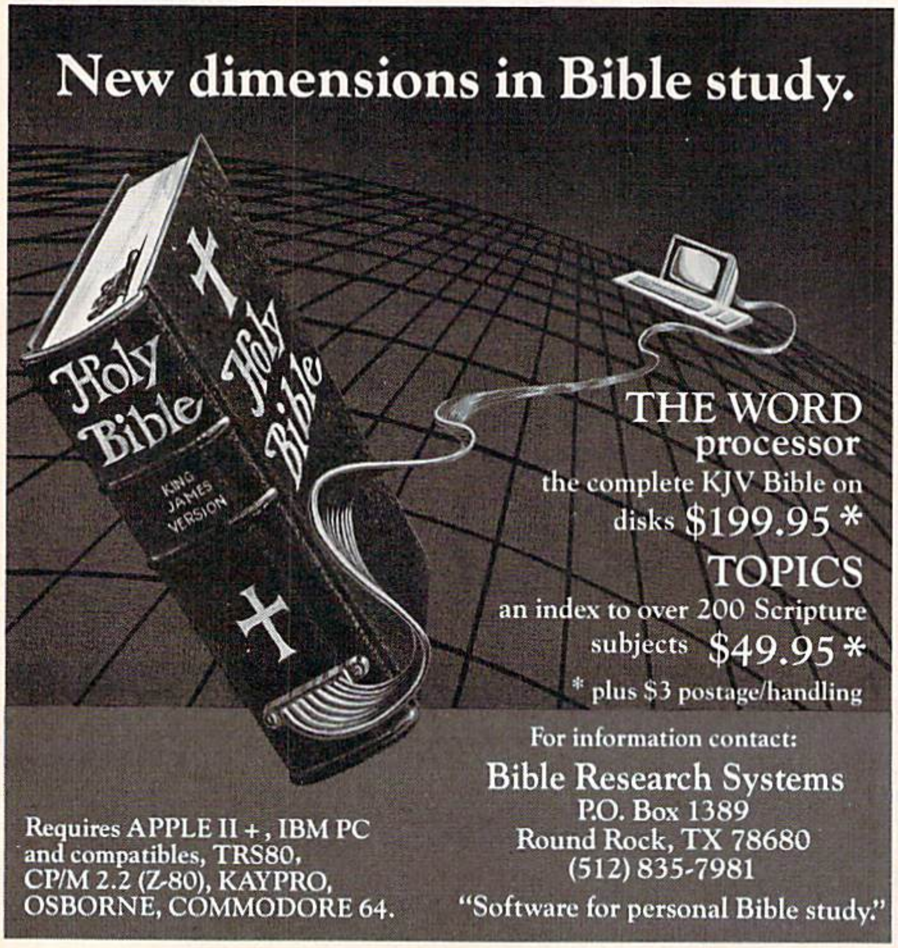
Listing 2 continued.

```
604 INPUTID$
606 INPUT"{SHFT C}OST, NO $ SIGN, <=9999.99";C$
608 PRINT"{SHFT I}NPUT NOTES, TO HERE..................
     ."
610 PRINT"{SHFT D}ON'T USE COMMAS OR COLONS.":INPUTNO$
615 IFLEN(D$+ID$+C$+NO$+"{4 SPACEs}")<=FTHENRETURN
616 PRINT"LENGTH";LEN(D$+ID$+C$+NO$+"{4 SPACEs}")
620 PRINT"{SHFT T}HE DATA YOU'VE INPUT IS TOO LONG TO F
     IT ON THE DISK RECORD."
625 PRINT"{SHFT T}RY AGAIN...":GOTO601
640 RETURN
800 REM HEADING SUBROUTINE
802 PRINT"{SHFT CLR}":PRINT"{SHFT C}OMPUTER {SHFT R}ECO
     RDS {SHFT S}UMMARY"
803 PRINTN$;" RECORDS WRITTEN"
805 PRINT:PRINT"{SHFT R}EC {SHFT D}ATE{5 SPACEs}{SHFT D
     }ESCRIPTION{10 SPACEs}{SHFT C}OST"
808 PRINT" #  DY/MO/YR"
809 PRINT"----------------------------------------"
810 RETURN
900 REM DISK ERROR CHECKING
902 INPUT#1,E,E$,E1,E2:IFE<20 OR E=50THENRETURN
905 PRINT"ERROR FROM STATEMENT";SN:PRINTE;E$:CLOSE2:CLO
     SE1:STOP:RETURN
910 RETURN
920 REM POSITION POINTER FOR GIVEN CHANNEL(R0),STARTING
      RECORD(R1) AND BYTE(R3)
925 R2=0:IFR1>255THENR2=INT(R1/256):R1=R1-256*R2
930 PRINT#1,"P"CHR$(R0)CHR$(R1)CHR$(R2)CHR$(R3):GOSUB90
     0
935 RETURN
```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subroutine at line 920. This subroutine calls the error-checking subroutine.

Line 70: Read the number of data records currently existing on the file. Convert the string variable into a number with the VAL function.

Line 105: Select the appropriate section of the program.

Line 200: This section lists all the records currently on the file.

Line 202: Initialize the total cost to zero.

Line 209: Write the display heading.

Line 210: Establish a For...Next loop to read the records, starting at the second.

Line 215: Position the disk to the first byte of the ith record.

Line 220: Read the data in the record. See line 341 for a description of what the record actually looks like.

Line 222: Right-justify the cost string so the decimal points will line up.

Line 225: Print the data and update the cost total by converting C$ to a number and adding it to T.

Line 226: Print the notes on a separate line.

Line 233: Convert the total cost to a string, and print it right-justified.

Line 290: Get back to the menu, if desired.

Line 300: This section allows you to change any part of any record. Note that I've tried to make the existence of a counter record on the file invisible to the user. The Input prompt refers to the data record, not the actual record number on the file.

Line 320: Input data record number you want to change.

Line 322: Position to the appropriate record.

Line 324: Read the data as it currently exists on the disk.

Line 330: Read in the new parameters (see line 600).

Line 340: Reposition the disk back to the beginning of this record. The positioning parameters from line 322 still apply. This is an easy step to forget; don't! Respecifying R1 = WH + 1 will be necessary only if you have more than 255 records on the file.

Line 341: Put the new data on the disk in place of what's already there. Each variable represents a "field" of characters. The fields are separated by a comma. A Return character CHR$(13) could also be used as a separator, but a semicolon cannot, despite what the 1541 user's manual says.

Note that you actually have to write the separator character on the record. PRINT#2,D$,ID$,C$,NO$ is *not* the same. PRINT#2,D$;ID$;C$;NO$ would put all the parameters together as one field. This is all right, but would require different treatment of the Input# command; the entire field would be read in as one variable, and then "decoded."

I'll have more to say about decoding records in Part 2 of this series. For now, as long as you have enough room on the record, using field separators is the easiest way to write and read disk records.

Two final points: you can't abbreviate Print# with a ?#, and remember that the Print# as I've written it here automatically puts a Return character after the last character in the last field.

Line 350: Give yourself a chance to update more records.

Line 400: This section is for adding new records to the file.

Line 415: Read in new data.

Line 430: Position to the start of the new record. As an example, if there are already ten data records on the disk, you're writing data record number 11, which will be the 12th record on the file.

Line 440: Write the data on the disk, with field separators.

Line 445: Update the date record counter.

Line 450: Give yourself a chance to add more records.

Line 455: Position back to the counter record.

Line 460: Write the new record counter on the disk every time you add new ones. This is another step that's easy to forget.

Line 500: This section is for closing files.

Line 510: CLOSE the data file first, then the command file.

Line 600: This subroutine is for reading in new data. If you're altering an old record, entering a Return in response to an Input prompt will leave the old data unchanged.

Line 603: Don't use commas or colons in the data fields. When you read the record, the comma will be interpreted as a field separator and the colon will signal the end of the record. The DOS has no way of knowing when commas or colons are intended as *part* of the data field.

Enclosing the whole data string in quotes when you input it won't help, either. This difficulty can be overcome by using different approaches to Print# and Input#, but it's not as easy as you'd like it to be. So, for this program, I've just avoided the problem altogether. I admit it can be a minor annoyance.

Line 615: The Input prompts give you some help about how many characters you're allowed for each data field, but they don't actually prevent you from inputting fields that are too long for the record length you've established with Open Rel File. You should provide a test for this, because your program will crash if you try to write too many characters on the disk record.

In this case, there are four fields, needing three separators. The Print# command adds one more character, the Return. I've indicated back in statement 5 that the maximum record length should be 80 characters. The test uses the LEN function to determine the length of all the data fields, plus four extra spaces.

Of course, you could still have just one field that's too long; perhaps you could get away with writing it on the disk, but your screen display would be messed up. You can test the length of each data field if you like. My concern here is to prevent an illegal disk operation.

Line 620: Give yourself a chance to correct your input if necessary.

Line 900: This subroutine performs disk error checking and prints the statement number SN if an error is detected.

Line 920: This subroutine positions the disk for reading or writing at a given channel number, record and byte. This requires some software activity in the DOS, as well as physical motion of the disk read/write mechanism. The time required for physical positioning is mostly what establishes the speed of disk operations. Positioning errors will be detected in subroutine 900.

In Conclusion

If you're interested in what this file program is doing, it might occur to you to generate some records with Computer Cost and then look at the file Compdata by loading Open Rel File and typing RUN1000. Are all the data fields there? No. You should be able to figure out why not, based on my previous discussions of the Input# and Print# commands. If not, I'll have more to say about it in Part 2 of this series.

Also in Part 2 will be a number of examples that will demonstrate many of the quirks and pitfalls associated with relative files. Once you've been through them, I hope you'll understand why I did things the way I did in Computer Cost and have a better idea of how to adapt relative file programs for your own purposes. Ⓡ

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C-64 Superkeys

This enhanced program listing offers the last word when it comes to defining function keys for the Commodore 64. The article also contains a useful overlay that will help you remember the function keys definitions.

By Jack W. Simmons

RUN It Right
Commodore 64

Address author correspondence to Jack W. Simmons, 5757 Bobby Dale Lane, Chattanooga, TN 37415.

When I first read "Programming VIC's Function Keys," by Jim Wilcox in the November 1982 issue of *COMPUTE!*, I had just purchased my new Commodore 64 and was anxious for some useful software. Wilcox wrote his program in machine language, which allows you to program the eight function keys of the VIC-20 so that a single keystroke performs operations normally executed while in the direct mode (List, Run, Save, Peek, Poke, etc.).

Because I was interested in learning assembly language for the 6502/6510 microprocessors, I decided to attempt a conversion of the program for use with the C-64. Armed with Jim Butterfield's Supermon (*COMPUTE!*, January 1983), as well as with memory maps of the VIC-20 and the C-64, I set out to accomplish the task.

The first obstacle I encountered involved the two memory locations (00 and 01) that make the VIC-20's 6502 chip different from the 6510 chip in the C-64. These locations are used by the hardware on the C-64 and are not available for machine language programs.

This is not the case for the VIC-20, and Wilcox used these two locations as working storage registers. In order to make the changes relatively simple, I decided to use two alternate locations in the zero page of memory, namely locations 247 and 248 ($F7 and $F8 hex). This is the RS-232 receive pointer, so if you're using the RS-232 port on your C-64, you'll need to choose two other locations if you plan to use this program.

The next obstacles were the subroutine branches to $C644 and $C474 in Wilcox's VIC program. Branches to these locations execute New and Ready in the VIC Basic ROM, and delete the Basic loader program after the function keys are defined. Equivalent locations on the C-64 are $A644 and $A474, respectively.

Finally, the IRQ vector on the VIC-20 is set to location $EABF. On the C-64 the vector is set to $EA31. This allows the C-64 to scan the keyboard sixty times each second to check, among other things, if one of the function keys is pressed.

Listing 1 is a converted version of Wilcox's VIC-20 program. If you have access to a recorded version of the VIC-20 program, you need only add lines 61–64 and 120–180. The remaining lines are unchanged.

Speedy Superkeys

As I began to use the converted program, I found it most helpful in reducing keystrokes for those repetitive operations I perform while in the direct mode, such as Print Peek(44), Run, List and SYS38893. These characters can be assigned to a function key and executed with a single keystroke.

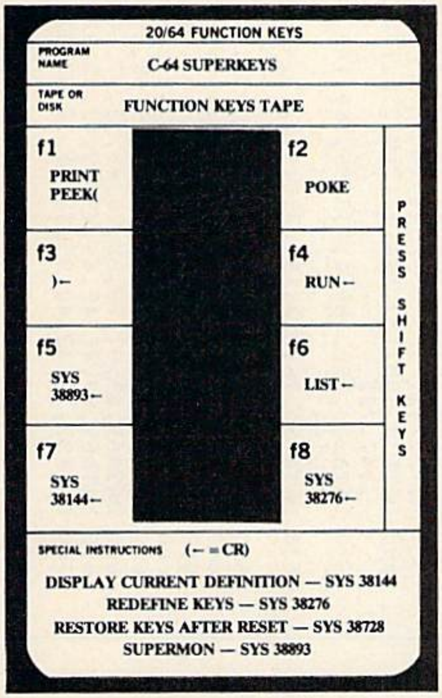
However, the more I used the program, I realized that several enhancements were needed before it would entirely meet my programming needs. Listing 2 is my enhanced version, entitled C-64 Superkeys, which, with the following changes, performs the same function as the simpler version of the program.

Because the C-64 has ample RAM available, there is no need to use the cassette buffer for the key-definition portion of the program. Consequently, I moved and revised this routine to allow you to easily redefine the keys when your needs change, without interference from tape I/O operations.

Supermon is always the first program I load into my C-64. It is located in $97ED–$9FFF. Therefore, I designed

C-64 Superkeys to reside just below Supermon, in $9400–$97EC. The program includes 255 bytes for storage of the function-key definitions. Additionally, the top of Basic pointers are set so that Basic programs do not interfere with either C-64 Superkeys or the key definitions.

Whenever you perform a warm start on the C-64 by pressing the run/stop and restore keys, the IRQ vector is reset to the normal location ($EA31). When this occurs, the function-key program no longer works, because the IRQ routine performs normally instead of allowing execution of the machine language routine that enables the function keys. C-64 Superkeys allows you to restore the function keys to their previously defined configuration after a warm restart.



20/64 FUNCTION KEYS

PROGRAM NAME: C-64 SUPERKEYS

TAPE OR DISK: FUNCTION KEYS TAPE

f1 PRINT PEEK(

f2 POKE

f3)←

f4 RUN←

f5 SYS 38893←

f6 LIST←

f7 SYS 38144←

f8 SYS 38276←

PRESS SHIFT KEYS

SPECIAL INSTRUCTIONS (← = CR)

DISPLAY CURRENT DEFINITION — SYS 38144
REDEFINE KEYS — SYS 38276
RESTORE KEYS AFTER RESET — SYS 38728
SUPERMON — SYS 38893

Fig. 1. Sample function keys overlay.

After defining the function keys and becoming involved in other programming matters, I often find I've forgotten the functions previously assigned to each key. C-64 Superkeys allows you to conveniently display the current key definitions and redefine keys if necessary. Wilcox's original version doesn't allow key redefinition after the program in the cassette buffer is destroyed.

Handy Overlays

I have designed a keyboard overlay for the VIC-20 or C-64 function keys that allows me to label each key with its current definition. I've found these overlays useful for the C-64 Superkeys program, as well as for other commercial or customized programs that use the function keys.

The overlays are especially useful for software such as games, where you select skill levels or program options via the function keys. An example of one of these overlays, with some of the functions I normally use with C-64 Superkeys, is shown in the accompanying Fig. 1.

Before running either program 1 or 2, be sure to type in the Data statements exactly as shown and save them to tape or disk. Run the program and wait for F1 = ? to appear on the screen. Follow this with the keystrokes you wish to assign to key 1 (use a back-arrow to represent a carriage return) and press the return key.

Repeat this procedure for each of the keys until all are defined. Simply press the return key if you don't want to define any particular key. After they are all defined, the computer will respond with READY, and the function keys are set to use.

If you're using C-64 Superkeys, rather than the translated VIC version, you can execute the following options at any time. To display the current key definitions, simply type SYS38144. To change them, type SYS38276.

I normally assign these two functions to keys 7 and 8 so that they are readily available and easily executable. To restore the operability of the function keys following a system warm restart, type SYS38728.

If you'd like a copy of C-64 Superkeys, but don't wish to enter all those Data statements, I'll send you two verified copies if you'll mail me a tape or disk, $3 and a self-addressed *stamped* mailer.

If you'd like five blank, professionally prepared keyboard overlays as described in this article, send an additional $3.50. You'll find them to be very handy when using C-64 Superkeys, and, as time goes by, you'll probably begin using function keys more in your own programs. Ⓡ

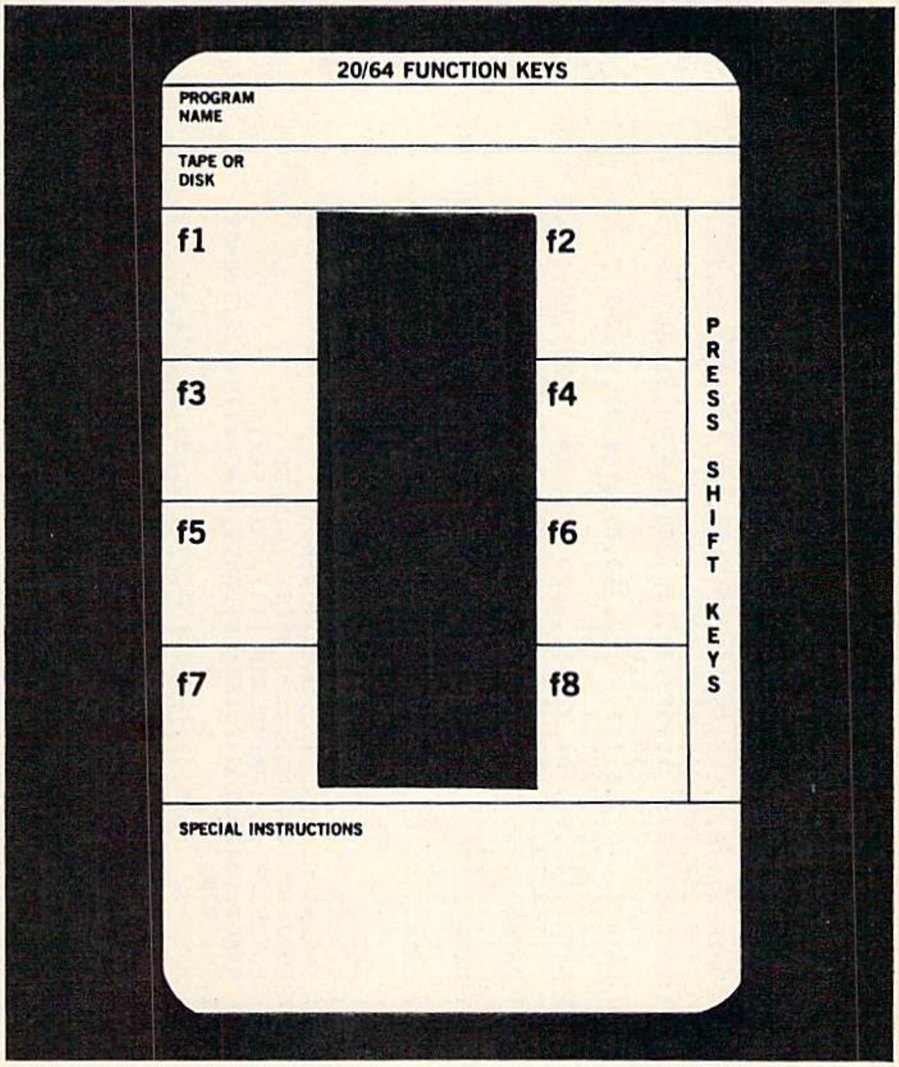


Fig. 2. Full-size blank overlay for your use.

Listing 1. C-64 conversion of Wilcox's VIC-20 program.

```
5 F=0:C=PEEK(55)-120:IFC<0THENC=C+256:F=-1
10 D=PEEK(56)+F:POKE55,C:POKE56,D:CLR
15 S=828:I=146:GOSUB100
20 DATA32,198,3,165,55,133,251,133,253,165,56,133,252,1
    33,254,169,49,133,0,169
25 DATA133,133,1,169,13,32,210,255,169,70,32,210,255,16
    5,0,32,210,255,169,61
30 DATA32,210,255,169,63,32,210,255,169,32,32,210,255,3
    2,207,255,72,160,0,165
35 DATA1,145,55,104,32,198,3,201,13,240,14,201,95,208,2
    ,169,13,145,55,32
40 DATA207,255,76,124,3,230,0,165,0,41,1,208,10,24,165,
    1,105,4,133,1
45 DATA76,170,3,56,165,1,233,3,133,1,165,0,201,57,144,1
    63,120,169,L0,141
50 DATA20,3,169,H0,141,21,3,88,169,0,133,0,32,68,198,76
    ,116,196,166,55
55 DATA208,2,198,56,198,55,96
60 S=PEEK(55)+256*PEEK(56):I=119:GOSUB100
61 FORJ=1TO6:READI,A:POKES+I,A:NEXT
62 FORJ=1TO14:READI,A:POKE828+I,A:NEXT
63 POKE53281,12:PRINTCHR$(144),CHR$(147)
64 READJ:FORI=JTOJ+30:READK:POKEI,K:POKEI+54272,1:NEXT
65 SYS(828)
70 DATA165,0,240,59,160,0,177,251,32,L99,H0,176,12,165,
    55,197,251,208,21,165
75 DATA56,197,252,208,15,169,0,133,0,165,253,133,251,16
    5,254,133,252,76,191,234
80 DATA166,198,177,251,157,119,2,230,198,32,L111,H0,165
    ,198,201,11,144,204,230
85 DATA0,76,191,234,165,215,32,L99,H0,176,3,76,191,234,
    165,8,41,1,208,247,160
90 DATA0,177,251,197,215,208,6,32,L111,H0,76,L6,H0,32,L
    111,H0,76,L81,H0,201
95 DATA133,144,6,201,141,176,2,56,96,24,96,166,251,208,
    2,198,252,198,251,96
100 F=0:FORD=STOS+I:READA$:IFASC(A$)<58THENA=VAL(A$):GO
     TO115
105 IFASC(A$)=76THENA=VAL(RIGHT$(A$,LEN(A$)-1))+PEEK(55
     ):IFA>255THENA=A-256:F=1
110 IFASC(A$)=72THENA=VAL(RIGHT$(A$,LEN(A$)-1))+PEEK(56
     )+F:F=0
115 POKED,A:NEXT:RETURN
120 DATA1,247,28,247,38,49,59,247,61,49,71,49
130 DATA18,247,22,248,34,247,60,248,86,247,88,247
140 DATA95,248,99,248,105,248,109,248,111,247
150 DATA131,247,134,166,137,164
160 DATA1067,3,54,52,32,6,21,14,3,20,9,15,14
170 DATA32,11,5,25,19,32,45,32,10,46,23
180 DATA46,19,9,13,13,15,14,19
```

Listing 2. C-64 Superkeys, an enhanced and converted version of Wilcox's VIC-20 program.

```
100 READA,B
110 PRINTCHR$(147);CHR$(17);"J.W.SIMMONS - C64 SUPERKEY
     S"
120 PRINT"IS BEING LOADED INTO MEMORY"
125 CHKSUM=0
130 FORI=ATOB:READX:POKEI,X:CHKSUM=CHKSUM+X:NEXT
135 IF CHKSUM<>85569 THEN GOTO150
140 SYS38276:END
150 PRINT"DATA STATEMENT CHECKSUM ERROR !!"
160 PRINT"CHECK TO MAKE SURE DATA STATEMENTS"
170 PRINT"WERE ENTERED CORRECTLY":END
500 DATA38144,38892
510 DATA169,147,32,210,255,162,1,160,74,32,174,150,162,
     183,160
520 DATA8,32,174,150,162,205,160,16,32,174,150,169,13,3
     2,210
530 DATA255,32,210,255,234,32,46,149,162,127,160,33,32,
     174,150
540 DATA96,162,255,160,49,189,0,148,201,133,240,37,201,
     134,240
550 DATA33,201,135,240,29,201,136,240,25,201,137,240,21
     ,201,138
560 DATA240,17,201,139,240,13,201,140,240,9,201,13,240,
     34,201
570 DATA255,208,32,96,169,13,32,210,255,169,70,32,210,2
     55,152
580 DATA32,210,255,200,169,61,32,210,255,169,32,32,210,
     255,202
590 DATA208,184,96,169,95,32,210,255,202,208,175,96,169
     ,12,141
600 DATA33,208,169,144,32,210,255,162,1,169,255,157,255
     ,147,232
610 DATA208,250,169,0,133,55,169,149,133,56,32,169,150,
     32,199
620 DATA150,76,212,150,255,147,17,42,42,42,42,32,67,32,
     54
630 DATA52,32,32,83,32,85,32,80,32,69,32,82,32,75,32
640 DATA69,32,89,32,83,32,42,42,42,42,13,32,13,42,42
650 DATA42,42,32,32,32,74,46,32,87,46,32,83,32,73,32
660 DATA77,32,77,32,79,32,78,32,83,32,32,32,42,42,42
670 DATA42,13,32,13,45,45,45,45,68,69,70,73,78,69,32
680 DATA69,65,67,72,32,70,85,78,67,84,73,79,78,32,75
690 DATA69,89,45,45,45,45,45,13,32,32,32,32,32,32,32
700 DATA32,32,32,40,95,32,61,32,67,82,41,13,32,13,32
```

More →

Listing 2 continued.

```
710 DATA32,32,32,83,89,83,32,51,56,50,55,54,32,84,79
720 DATA32,82,69,68,69,70,73,78,69,32,75,69,89,83,13
730 DATA32,32,32,32,83,89,83,32,51,56,49,52,52,32,84
740 DATA79,32,80,82,73,78,84,32,67,85,82,82,69,78,84
750 DATA13,32,32,32,32,32,32,32,32,32,32,32,32,32,32
760 DATA75,69,89,32,68,69,70,73,78,73,84,73,79,78,83
770 DATA13,45,45,45,45,45,45,45,45,45,45,45,45,45,45
780 DATA45,45,45,45,45,45,45,45,45,45,45,45,45,45,45
790 DATA45,45,45,45,13,162,1,172,169,149,189,169,149,32
     ,210
800 DATA255,232,136,152,208,245,96,234,234,234,234,234,
     234,234,234
810 DATA234,234,234,234,234,120,169,49,141,20,3,169,234
     ,141,21
820 DATA3,88,96,32,94,151,165,55,133,251,133,253,165,56
     ,133
830 DATA252,133,254,169,49,133,247,169,133,133,248,169,
     13,32,210
840 DATA255,169,70,32,210,255,165,247,32,210,255,169,61
     ,32,210
850 DATA255,169,63,32,210,255,169,32,32,210,255,32,207,
     255,72
860 DATA160,0,165,248,145,55,104,32,94,151,201,13,240,1
     4,201
870 DATA95,208,2,169,13,145,55,32,207,255,76,20,151,230
     ,247
880 DATA165,247,41,1,208,10,24,165,248,105,4,133,248,76
     ,66
890 DATA151,56,165,248,233,3,133,248,165,247,201,57,144
     ,163,120
900 DATA169,117,141,20,3,169,151,141,21,3,88,169,0,133,
     247
910 DATA96,234,234,234,234,234,166,55,208,2,198,56,198,
     55,96
920 DATA234,234,234,234,234,234,234,234,234,234,234,234
     ,234,234,165
930 DATA247,240,59,160,0,177,251,32,216,151,176,12,165,
     55,197
940 DATA251,208,21,165,56,197,252,208,15,169,0,133,247,
     165,253
950 DATA133,251,165,254,133,252,76,49,234,166,198,177,2
     51,157,119
960 DATA2,230,198,32,228,151,165,198,201,11,144,204,230
     ,247,76
970 DATA49,234,165,215,32,216,151,176,3,76,49,234,165,8
     ,41
980 DATA1,208,247,160,0,177,251,197,215,208,6,32,228,15
     1,76
990 DATA123,151,32,228,151,76,198,151,201,133,144,6,201
     ,141,176
1000 DATA2,56,96,24,96,166,251,208,2,198,252,198,251,96
```

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Color Combo Dilemma

Coping with Commodore's color combinations can be confusing. This article lets you brighten up your microcomputing decor and helps you determine which combo works best for your particular application.

By Karl Thurber

Address author correspondence to Karl Thurber, Jr., 317 Poplar Drive, Millbrook, AL 36054.

The VIC-20's standard blue text on white background, with a blue border, looks good on most TV sets and color monitors, though the monitor's quality is better.

For many utility and business programs, the use of black text, rather than blue, makes for a more professional and higher contrast appearance (though the blue border still looks fine).

The black text can be obtained by simply typing PRINT "[CTRL 1]" in an early line of the program. In some applications, you may wish to omit the border; that is, let it be the same color as the background.

Appendix E of the VIC-20's instruction manual contains the complete list of screen and border color combinations; for example, to obtain both a white screen and border, type in POKE 36879,25.

Try experimenting with the values shown in this table along with the eight text colors to see which combinations give the most pleasant appearance on your monitor for your particular application. With a black and white or green-screen monitor, these selections won't be of great concern, but certain screen and cursor colors will result in reduced contrast, and, in extreme cases, unreadable text and/or viewing fatigue.

Bear in mind that the screen, border and text color combinations you select using Poke and Print statements will remain active in the computer's memory, unless another subsequently run program changes these color combinations, or unless the computer is either reset or turned off and recycled on.

Surprisingly, many find the Commodore 64's color display to be less sharp and clear than the display of the less expensive VIC-20. While the VIC's colors don't seem to have a compatibility problem, you must be very careful with the assignment of screen, border and text colors when using the C-64. While the low contrast, light blue text on blue background obtained on power-up is tolerable, better displays are possible.

Most of the 64's colors will look alright on a black and white or green-screen monitor, but it's a different ballgame when using a color monitor.

For best readability of text on a color monitor, a stark, high contrast black and white effect can be achieved by entering in an early line of a program:

```
POKE 53280,1:POKE 53281,15:PRINT
"[COMD 5]"
```

The text produced is particularly sharp; the dark gray text is set against a very light gray background with white border—a combination that may be too stark, with too much contrast, for some tastes.

(A popular combination you may have trouble with on your color monitor is, surprisingly, black text on a white background. Many monitors, including the Comrex CR-6500, blur when this particular combination is used.)

For most business and utility programs, a very satisfactory gray-on-gray is achieved with:

```
POKE 53280,0:POKE 53281,11:PRINT
"[COMD 5]"
```

The result is a very businesslike screen presentation.

A pleasing dark gray text on white background for many general purposes is achieved with the following:

```
POKE 53280,6:POKE 53281,12:PRINT
"[COMD 4]"
```

This series of commands produces a blue border; an alternate border (red) is achieved by changing the first Poke to 53280,2.

Many users find that the screen display is cleaned up nicely by simply poking in a green border and gray #3 screen—POKE 53280, 5:POKE 53281, 15. Considering the specific application, you can try many other combinations on your particular monitor.

Note that there's considerable interaction in overall screen appearance between the border and background colors, so when you change one, be sure to run through various combinations of the other (and text colors, too) when you look for the most natural and pleasant display.

Also, you could consult the chart entitled Suggested Screen and Character Combinations, on page 152 of the *Commodore 64 Programmer's Reference Guide* to see which color combinations should be avoided, and which should work well together.

Note that there are 256 border and screen combinations possible on the 64. Then, too, there are 16 colors available for text, so the choices are wide, indeed!

Extra Tips

For games which make use of many colors, either a black or a white background will probably give you the fewest problems with incompatible color combinations.

> *There are 256*
> *border and screen combinations*
> *possible on the 64,*
> *with 16 colors*
> *available for text.*

Of special interest to owners of the Commodore 1701 or 1702 color monitor: These monitors contain special circuitry that dramatically improves the C-64's video presentation, making most color combinations compatible with one another. With my 1701, I have settled on two primary color schemes:

1. For most general-purpose programs, I use a high-contrast, light-gray-on-dark gray with a blue border, achieved by typing in:

```
POKE53280,6:POKE53281,11:PRINT
"[COMD 8]"
```

2. For an easy-on-the-eyes, simulated green-screen monitor presentation that's just right for word processing, you can obtain a superb screen display with:

```
POKE 53280, 13:POKE 53281,13:PRINT
"[COMD 5]"
```

Both of these color schemes produce on the 1701 or 1702 monitors highly readable displays that make most of the C-64's color problems vanish. Naturally, the color intensity, brightness and contrast controls on the monitor's front panel must be adjusted for the best presentation.

Also, to benefit from these monitors' outstanding capabilities, you *must* connect them to the C-64 with a three-wire (luminance, chroma and audio) cable, not with a two-wire cable. The latter is suitable for connecting up the VIC-20, but not the C-64.

If you have both computers, connect the VIC to the 1701's or 1702's front panel connectors using a two-wire cable. Connect the C-64 to the rear panel connectors with a three-wire cable. You may use the rear slide switch on the monitor to select display between the two computers without plugging or unplugging. Ⓡ

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Create a VICasso, Part II

Enter the multicolorful world of graphics characters with the techniques described in this tutorial for the unexpanded VIC-20.

By Stephen Erwin

RUN It Right

VIC-20

Address author correspondence to Stephen Erwin, 102 Hickory Court, Portland, IN 47371.

The first installment of this article ("Create a VICasso," *RUN*, February 1984) discussed the basic steps necessary to make programmable characters for your VIC-20, and it described a Programmable Character Generator to do all the hard work for you. As you may recall, the first step is to transfer 64 characters from ROM into RAM, where they can be redesigned. Each of these characters is made up of 64 dots (eight bytes of memory, with eight bits per byte and each bit controlling a dot).

Multicolor characters are also made up of 64 dots, but when they're printed, only 32 larger dots are visible. It seems the computer must have some way to tell which colors to use, and it does this by grouping the dots in pairs. It takes two high-resolution dots to make one multicolor dot.

Try this: enter POKE 646,10 and then type a few letters. The letters look strange and are hard to read because each dot is twice as wide and the dots are different colors. Now hold down the CTRL key and type 7 to return the screen to normal.

One way to enter the world of multicolor characters is to Poke location 646 with a number equal to the normal character color Poke plus 8. This allows printing in the multicolor mode. You can restore normal colors by using the CTRL key and the color keys as usual.

Multicolor characters can use up to four colors: the screen, border, auxiliary and character colors. You set the screen and border colors for the entire

0 black	8 orange
1 white	9 lt. orange
2 red	10 pink
3 cyan	11 lt. cyan
4 purple	12 lt. purple
5 green	13 lt. green
6 blue	14 lt. blue
7 yellow	15 lt. yellow

Fig. 1. VIC-20 color Pokes.

00= screen color
01= border color
10= character color
11= auxiliary color

Fig. 2. The bit pattern for displaying the colors.

@	A	B
1 1 1 1 1 0 1 0	0 0 0 0 0 0 0 0	0 0 1 0 0 0 0 0
1 1 1 1 1 0 1 0	0 0 0 0 0 0 0 0	0 0 1 0 0 0 0 0
1 1 1 1 1 0 1 0	0 0 0 1 0 1 0 0	0 0 1 0 0 0 0 0
1 1 1 1 1 0 1 0	0 0 0 1 0 1 0 0	0 0 1 0 0 0 0 0
0 1 0 1 0 0 0 0	0 0 1 1 0 1 0 0	0 0 1 0 0 0 0 0
0 1 0 1 0 0 0 0	0 0 1 1 0 1 0 0	0 0 1 1 1 1 0 0
0 1 0 1 0 0 0 0	0 0 1 1 0 1 0 1	0 0 1 1 1 1 0 0
0 1 0 1 0 0 0 0	0 0 1 1 0 1 0 1	0 0 1 1 0 0 0 0

Fig. 3. Three color characters.

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screen by Poking location 36879 with the values on page 134 of the user's guide. The auxiliary color, used only for the multicolor characters, is also set for the entire screen by using the following formula, where X equals the color Poke from Fig. 1.

```
POKE 36878,X*16
```

Character color is the only one that can be different in each character. It is set as described above for printing, or you can Poke the normal character color code plus 8 into the screen color location when you're Poking characters onto the screen.

Fig. 2 shows the bit pattern necessary to display each color. To show how this works, we're going to make three characters with the bit patterns as shown in Fig. 3.

If you have a Programmable Character Generator, you can use it to draw these characters. If not, you can enter the short program in Listing 1. When either program has been run, typing an @ will produce the first odd little character in Fig. 3. The character has been divided into four small boxes, with each box containing the bit pattern for a different color.

```
10 POKE 52,28:POKE56,28:CLR
20 FOR T=7168 TO 7679:POKE T,PEEK(T+25600):NEXT
30 POKE36869,255
40 READ A: IF A=-1 THEN200
50 FOR T=0TO7:READ B:POKE7168+A*8+T,B:NEXT
60 GOTO 40
61 DATA 0 ,250,250,250,250,80,80,80,80
62 DATA 1 ,0,0,20,20,52,52,53,53
63 DATA 2 ,32,32,32,32,32,60,60,48
200 DATA-1
```

Listing 1. Multicolor generator program.

Now enter POKE 646,13 and type the @. Suddenly the holes in the character have been filled in, and it is now composed of four solid blocks of color. In this case, black is the auxiliary color, green is the character color, cyan is the border color and white is the screen color. Now enter

```
POKE 36878,10*16: POKE 646,13:
POKE 36879,24
PRINT CHR$(65):PRINT CHR$(66)
```

You have suddenly transformed characters A and B into a side view of a little girl. The detail is poor because of the low resolution. However, by combining colors and using the auxiliary color pink for the skin (a color which couldn't be used in characters before), you have created an attractive figure that would look quite nice in a game program.

One advantage of auxiliary color is that it gives you the ability to introduce colors which are outside the color range of standard characters. Unfortunately, only one auxiliary color can be used for the whole screen at any one time.

As you should see by now, the trick to drawing multicolor characters on the Programmable Character Generator is learning to visualize what the characters will look like after they have been converted to multicolor—with the double dot patterns converted to solid multicolor dots.

If this proves too difficult, another method is to draw the character as a solid character, remembering to keep the dots in pairs. Then when the character is complete, use the F3 erase function to create the proper dot pattern for the colors. Testing is done by Poking location 646 with the desired multicolor character color Poke and then using the CTRL and the blue keys to return the screen to normal before continuing.

Try one last experiment. Enter this:

```
PRINT CHR$(147):POKE 646,10:
FOR T=0 TO 220: PRINT CHR$(64);:NEXT
```

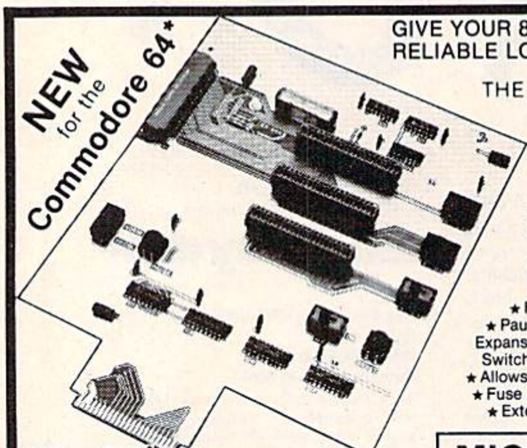
Now enter the following three pokes, one at a time:

```
POKE 36878,2*16
POKE 36879,25
POKE 36878,9*16
```

In each case the entire display is altered instantly to what appears to be an entirely different character. This instant action across the entire screen is another advantage of multicolor characters.

The special effects possible for games are limited only by your imagination. Have fun!

For a tape copy of the Programmable Character Generator for the unexpanded VIC, send me a tape, a self-addressed stamped envelope and $3—or just send $4.50—and I'll be glad to oblige. R



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A mime at the Commodore pavillion poses with the silver-plated two-millionth VIC-20 to come off the assembly lines.

Roving reporter Tom Benford—a little foot-weary and bleary-eyed—recently returned from the CES Show in Las Vegas with tales of many new products for the Commodore, including several new Commodore computers, and his view of industry trends.

By Tom Benford

Exciting is the word that best describes the 1984 Winter Consumer Electronics Show (CES). Over 80,000 people attended the exhibition on each of the four days at the Convention Center in Las Vegas, Nevada.

Manufacturers, retailers, distributors, dealers, publishers and members of the press from all over came to see what the electronics industry had to offer at this desert recreationland. Of course, the computer and software industries were well represented, with Commodore having one of the largest and most elaborate exhibits.

Much at the show indicated that the computer, peripheral and software industries are thriving, that technology is taking quantum leaps and that the beneficiary of all this progress is ultimately the end consumer—you!

Address author correspondence to Tom Benford, 520 Havens Cove Road, Bricktown, NJ 08723.

Well-known Commodore "guru" Jim Butterfield demonstrated and explained the C-264 and C-V364 computers, SFS481 disk drive and 1703 monitor at the Commodore pavilion.

Commodore Kicks It Off

Anyone who doubts the impact of Commodore's machines on the American public should have been at the show, where almost every exhibitor had something of interest to Commodore users. Although there was also a lot of emphasis on the Apples and the IBM-PC and PCjrs., it seems that the Commodore 64 has become the standard computer of the home and small-business user.

A press conference held by Commodore on the first night (January 7), revealed the news that Commodore is the first home-computer manufacturer to break the one-billion dollar sales mark. Commodore also showed its new applications computer, the C-264, as the leader in its 264 series. (If you read last month's issue of *RUN*, you know we had the exclusive pre-CES scoop on this hot new model!)

Other new models shown were the C-V364, which incorporates all of the 264's features and adds a 19-key numeric keypad and built-in speech capability; the "mysterious" Model 116 briefcase-sized portable with 16K of built-in RAM (it's mysterious because, although they put it on display, Commodore won't divulge any information about it until it's ready for release later this year); the SFS481 fast disk drive; the C-1703 color monitor; the C-1542 disk drive; the C-1531 cassette drive; the MCS801 and MPS802 dot-matrix printers; the DPS1101 daisy-wheel printer; and the C-1520 plotter/printer. The Magic Voice speech module and many software packages were also unveiled.

The press conference also outlined Commodore's present and planned activities in telecomputing, home banking services, new product development and marketing, educational commitments, computer speech technology and the future directions of software and technology. According to Commodore, the emphasis of the industry as a whole will be on "productivity" software, and the company is focusing its efforts in this direction.

Productivity software refers to programs that do useful, practical work for you, rather than entertain. An example of productivity software is the Micro Cookbook, by Virtual Combinatics, which is a household management program providing complete cookbook and recipe management.

The Commodore exhibit at the show was more a pavilion than a booth, since it was bi-level and massive, taking up a huge amount of floor space with a multitude of demonstration computers and video monitors.

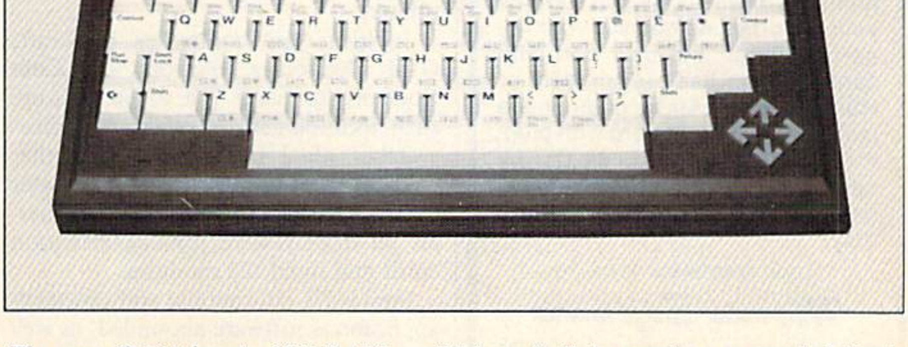
Jim Butterfield, the well-known Commodore "guru," was featured at the exhibit, where he demonstrated and explained the new C-264 model and the 264 series product line.

A mime milled about through the crowds, passing out balloons and buttons, while a jovial "croupier" dealt hands of Three-Card Monty to passers-by—all in keeping with the festive carnival atmosphere of Las Vegas.

On exhibit inside protective Plexiglas cases were two very special computers: a silver-plated VIC-20 that represented the two-millionth VIC made; and across from it a gold-plated C-64 which represented the one-millionth 64 produced. Another especially interesting item on display was the SX-64 Executive Portable (look for my product review of it in the May issue).

A Trendy Show

The hotter trends in technology are focusing on speech/music synthesis and hi-resolution graphics software and peripherals. The Alien Group took the laurels in the speech department with its Voice Box speech synthesizer for both the VIC-20 and C-64. This unit even sings while producing its own musical accompaniment on the C-64 via Alien's music synthesis software and the



The new C-264 boasts 60K RAM available, a built-in monitor, expanded Basic commands and more.

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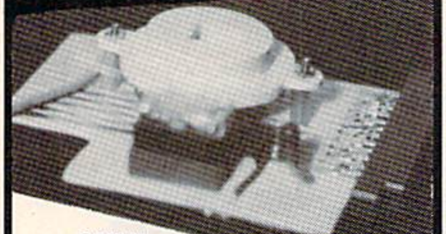

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> *C-64 was the obvious target of the marketing thrust in new programs.*

Commodore 64's SID chip.

Waveform was displaying and demonstrating its outstanding MusiCalc software line, and Kapri Software introduced Studio 64, another noteworthy music program. Commodore itself got into the arena with its Magic Voice speech module for the C-64 and the built-in speech capability of the C-V364 as well as the Music Machine and Music Composer cartridges for the C-64. Graphics displays also drew lots of attention with such outstanding products as the KoalaPad and the Chalk Board graphics tablets.

In the floppy-disk department, Concorde premiered its new parallel-port disk drive that is compatible with the C-64, while Micro Systems Development proudly displayed both its single and dual disk drives for the VIC-20 and C-64, units that feature both parallel and serial ports.

Commodore's new fast drive, the SFS481, intended for use with the 264 series of computers, unfortunately won't work with the VIC or C-64. On the bright side, however, the new model 1542 will.

Printers are also making big news, with Cardco, Epson, Star and Gorilla among the many companies exhibiting new lines of both dot-matrix and daisy-wheel models. The manufacturing/marketing trend is taking a decided swing toward daisy-wheel letter-quality printers at prices rivaling those of the better-quality dot-matrix models. As mentioned above, Commodore also unveiled several new models, including the impressive MCS801 color dot-matrix model and the DPS1101 daisy-wheel printer.

Joysticks and controllers by Kraft, GIM Electronics, Suncom and Coin Controls, to name but a few, feature such technological advances as microswitches, dual fire-buttons and other niceties that promise to better your gaming scores. Other gaming peripherals on display were joystick extension cords and rapid-fire modules.

Impressive educational and practical-applications software abounded, as well as recreational and gaming programs. Although there was a substantial amount of VIC-20 software, the C-64 was the obvious target of the marketing thrust in new programs.

Disk-based software for the 64 seems to be the way to go, since there's only so much data that can be squeezed into a ROM cartridge. It's obvious that the software companies recognize the excellence of the C-64's SID chip and sprite graphics capabilities.

"Talking" software is also a hot item this year, with Commodore adding speech capability to many of its products. The Gorf and Wizard of Wor game cartridges, when used with the Magic Voice module, and the Magic Desk II are all endowed with speech capability.

The long-expected shakedown of the computer industry has for the most part passed, with several companies going under, while the survivors prosper beyond all expectations. Industry trends confirm that the dedicated game machine has lost substantial ground to the home computer. The latter has proved that it can achieve the same degree of excellence for games as the video-game machine, while also offering the capabilities of a full-blown computer.

Game software is becoming ever more complex, with strategy and adventure games overtaking the shoot-'em-ups that have been so popular in the past. Indeed, games are now combining the need for deductive reasoning and strategy with good hand-eye coordination, and we can expect this trend to continue to grow and expand.

Everyone at the Winter CES seemed to be enjoying the show, especially the press contingent. There was a good sense of comaraderie amongst the writers and editors in attendance, with nary a trace of competitive jealousy.

In general, it made for good "vibes" to know that we were all jointly there for a single purpose—to report to our readers news of the exciting things happening in the world of home computing. You can be sure that we'll be covering these products and developments in our in-depth reviews in coming issues of *RUN*.

The attitude of almost everyone I spoke with at the show indicated that home computers are no longer the coming thing, but are very much a way of life for many households, with more people purchasing and using them all the time. The question is no longer, "Why do I need a home computer?", but instead, "What can I do with it to make life easier now that I have one?" Based on what I saw at the Winter CES, you can do plenty. R

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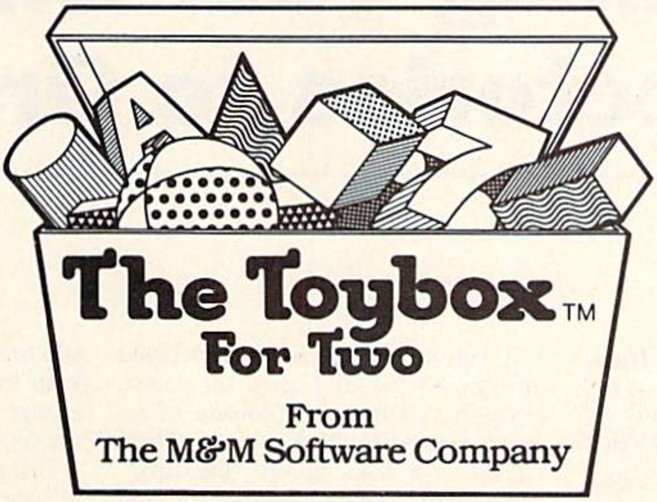

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Calling Your Disk Directories to Order

Having trouble keeping track of your disk files? This program for the C-64 prints your disk directories with the filenames neatly tag-sorted in alphabetical order.

By Michael Broussard

RUN It Right

Commodore 64
disk drive and printer

Address author correspondence to Michael Broussard, 15279 Forest Grove Drive, Woodbridge, VA 22191.

If you collect (or write) disk-based software as fast as I seem to, you've probably run into the problem of remembering what software is on which disk. I have disks named "backups," "backups.2" and "backups.3," and there just isn't enough room on that little label to list all the files stored on each. Looking for a particular version of a particular program can be frustrating and time consuming.

Loading a disk directory into memory (LOAD "$",8) and listing it to the screen is easy enough, but if the disk has many files on it, more than half the names can scroll off the screen before you have a chance to read them. In addition, the names are not in useful order, since the disk operating system (DOS) uses the next available directory entry on the disk when cataloging a new file, and that's the order they're in when you list them. Loading the disk directory into memory also has the unfortunate side effect that you lose any Basic program in memory at the time.

You can get a peek at the directory without disturbing a Basic program in memory by loading a "disk wedge" into memory as soon as you power the system on. Wedges are machine language programs that allow you to list the disk directory (and usually do other functions as well) without affecting the currently loaded Basic program. A wedge is useful as long as you remember to load it before you need it!

This article describes a handy utility program that will help you keep track of your disk files. It's a simple Basic program that reads the disk directory, sorts the filenames into alphabetical order and produces a printer listing you can slip into the protective jacket along with the disk. Although it won't replace the wedge (you don't want to stop and print a new directory listing each time you add or delete a disk file), it will help you keep track of files on disks that don't change very often, such as game libraries, backups, etc.

Using the program is easy. You simply run it to produce a printer listing of the directory of the disk currently in the drive (the program assumes drive 0).

Before beginning to print, the program displays the prompt LABEL STRING?, at which time you have the option of entering a string that will appear at the top of the directory listing near the title. (I typically type in the current date, so later on I can tell when the listing was made.) If you simply press the return key in response to the prompt, no extra information appears on the listing.

How the Program Works

Now you know what the program does, let's see how it works. The disk directory is stored on the disk in much the same way as a file. Line 120 of the program opens the disk error channel and then opens the directory as a file. (The directory has the special filename "$".)

After attempting the open, the program does a GOSUB 480, jumping to a subroutine that checks the error channel to see if anything unexpected has happened. In case of an error, the program prints an appropriate error message and ends.

The directory contains some header information (the name of the disk, etc.) and an entry for each file on the disk. Each file entry contains the name of the file, its length in blocks, its type and where the file is located on the disk.

Once the directory is successfully opened, the program reads it one character at a time, collecting information about each file and storing it in one of the three arrays described below. In addition, it keeps track—in the variable

N—of the number of file entries it has processed.

For each entry in the directory, the first information of interest is the file's length. Lines 140 through 160 first skip over some file information you don't care about, then get the length and put it into the next available slot of the array FL. Line 170 then attempts to read another character from the directory.

If the status (ST) of the read is 0, you've not reached the end of the directory, and the program continues reading from the disk until it encounters a double quote (''). This is a signal that a filename is next. Lines 190 through 200 read characters from the disk, appending them to the variable N$. When another double quote is found, it marks the end of the filename, and the program stores N$ (the filename) in the next available slot of the array FX$.

Line 220 continues reading the directory, skipping over blanks (CHR$(32)). The first nonblank character is the first letter of the program type (e.g., PRG, SEQ or RND). Lines 230 through 250 store the program type in the next available slot of the array FT$.

The last part of line 250 again checks the disk read status (ST). You've finished processing the directory entry for one file, and if the status is 0, the program branches back to line 140 in order to read the entry for the next one.

If the status is not 0, it means you have finished reading the directory (or have encountered some sort of disk error during the get). It's now time to process the data you've collected about the files, but first a couple of points should be made.

The first and last "file entries" processed by lines 140 through 240 do not describe files. The first is actually the disk header; instead of getting the name of a file when you process it, you get the name of the disk. Although the array FX$ is predominantly used to store names of files, the program initially sets the variable N (the file counter) to −1. Just before storing the name of a file, the program increments N by 1, so that the name of the disk gets neatly tucked away into FX$(0).

The last entry in the directory doesn't describe a file either. Instead, it tells how many free blocks are left on the disk. After the program has processed this last entry, the status ST will be 64, meaning "end of file." At this point, the program continues at line 260, where it closes the directory file. You remember the number of blocks free (BF) by copying it from FL(N), and you subtract 1 from the number of files (N), since the last entry doesn't describe a file.

Now you've read the disk directory and built your arrays of file information. FX$(1) contains the name of the first file. FT$(1) tells us what type of file it is, and FL(1) tells us its length in blocks. Information about the second

```
100 DIMFX$(256),FT$(256),FL(256),TT(256):N=-1:FORI=1TO2
     56:FX$(I)="":NEXT:X=221
110 BL$=" ":FORI=1TO40:BL$=BL$+"{SHFT SPACE}":NEXT
120 CLOSE15:OPEN15,8,15:OPEN1,8,0,"$0":GOSUB480:GET#1,A
     $,B$
130 W=51:L$="":INPUT"LABEL STRING";L$
135 IFLEN(L$)>22THEN PRINT"LABEL STRING TOO LONG-MAX IS
      22 CHARACTERS.":GOTO130
140 GET#1,A$,B$:GET#1,A$,B$:C=0:IFA$<>""THENC=ASC(A$)
150 IF B$<>"" THEN C=C+ASC(B$)*256
160 N=N+1:FL(N)=C
170 GET#1,B$:IF ST<>0 THEN260
180 IF B$<>CHR$(34) THEN170
190 N$=""
200 GET#1,B$:IFB$<>CHR$(34)THENN$=N$+B$:GOTO200
210 FX$(N)=N$
220 GET#1,B$:IF B$=CHR$(32) THEN220
230 C$=""
240 C$=C$+B$:GET#1,B$:IF B$<>""{2 SPACEs}THEN240
250 FT$(N)=LEFT$(C$,3):IFST=0THEN140
260 CLOSE1:BF=FL(N):N=N-1:GOSUB580
270 CLOSE3:OPEN3,4
280 PRINT#3,CHR$(176);:FORI=1TO51:PRINT#3,CHR$(192);:NE
     XT:PRINT#3,CHR$(174)
290 PRINT#3,CHR$(X);SPC(51);CHR$(X)
300 T2$=FX$(0):IFL$<>""THENT2$=T2$+"{2 SHFT SPACEs}("+L
     $+")"
310 T$=CHR$(X)+"{5 SPACEs}>>> "+FX$(0)
315 IFL$=""THENT$=T$+MID$(BL$,1,W-LEN(T$)-1):GOTO330
320 K=W-2-LEN(T$)-LEN(L$):T$=T$+MID$(BL$,1,K-1)+"("+L$+
     ")"
330 T$=T$+"{2 SPACEs}"+CHR$(X):PRINT#3,T$
340 PRINT#3,CHR$(X);SPC(51);CHR$(X)
350 PRINT#3,CHR$(171);:FORI=1TO51:PRINT#3,CHR$(192);:NE
     XT:PRINT#3,CHR$(179)
360 PRINT#3,CHR$(X);SPC(51);CHR$(X)
370 L=9:K=INT((N+1)/2):FORI=1TOK
380 T$=CHR$(X):J=I:GOSUB520:T$=T$+" ":J=K+I:GOSUB520:T$
     =T$+"{2 SPACEs}"+CHR$(X)
390 PRINT#3,T$ : L=L+1 : NEXT
400 PRINT#3,CHR$(X);SPC(51);CHR$(X)
410 P=INT((BF*100/664)+.5):P$=MID$(STR$(P),2)
420 T$=CHR$(X)+MID$(BL$,1,14)+STR$(BF)+" BLOCKS ("+P$+"
     %) FREE"
430 T$=T$+MID$(BL$,1,W-LEN(T$)+1)+CHR$(X):PRINT#3,T$
440 FORI=LTO27:PRINT#3,CHR$(X);SPC(51)CHR$(X)
450 NEXT
460 PRINT#3,CHR$(173);:FORI=1TO51:PRINT#3,CHR$(192);:NE
     XT:PRINT#3,CHR$(189)
470 PRINT#3:CLOSE3:CLOSE15:END
480 INPUT#15,ER,ER$:IFER<20THENRETURN
490 IFER=74ORER=21THENER$=ER$+"--IS DISK INSERTED?":GOT
     O510
500 ER$="DISK ERROR"+STR$(ER)+": "+ER$
510 PRINTER$:END
520 T=TT(J):IFT=0THENT$=T$+MID$(BL$,1,24):RETURN
530 IFFL(T)<100THENT$=T$+"{SHFT SPACE}"
540 IFFL(T)<10THENT$=T$+"{SHFT SPACE}"
550 T$=T$+MID$(STR$(FL(T)),2)+"{SHFT SPACE}"+FX$(T)
560 IF LEN(FX$(T))<16THENT$=T$+MID$(BL$,1,16-LEN(FX$(T)
     ))
570 T$=T$+"{SHFT SPACE}"+LEFT$(FT$(T),3):RETURN
580 FOR I=1 TO N : TT(I)=I : NEXT
590 FORI=1 TO N-1 : S=I : FOR J=I+1 TO N : IF FX$(TT(J)
     )<FX$(TT(S)) THEN S=J
600 NEXT J : IF S<>I THEN T=TT(I) : TT(I)=TT(S) : TT(S)
     =T
610 NEXT I : RETURN
```

Listing. Disk directory utility program for the C-64.

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file is in FX$(2), FT$(2), and FL(2)—and so on for each file (up to file N) on the disk. FX$(0) contains the name of the disk.

The next task is to sort the data in the arrays into alphabetical order by filename. The program accomplishes this by using a "tag sort." Let's see what a tag sort is and how it works.

Tag Sorting

Suppose you have two arrays, one called N$, containing names, and one called A$, containing corresponding addresses. The arrays might look like this:

N$(1): SMITH	A$(1): ELM ST.
N$(2): JONES	A$(2): OAK DR.
N$(3): BROWN	A$(3): CENTER ST.
N$(4): ADAMS	A$(4): MAIN ST.

In order to sort the arrays, you need to move both names and addresses around. A typical sort would inspect all the names in the N$ array in order to find the one closest to the beginning of the alphabet (in this case, Adams). Adams would then be moved to the beginning of N$, and whatever name it replaced (Smith in this example) would move to where Adams was.

In addition, you'd also have to swap A$(1) and A$(4) in order to keep the corresponding addresses correct. Once Adams has been sorted into its proper position in N$, this type of sort would begin the searching and moving process all over again to find the next name (Brown), and so on until all the names were sorted.

Although this technique is effective, it has a severe disadvantage. Moving strings around in Basic tends to be slow, and the above approach requires that every string in both arrays be moved at least once. As an alternative, let's see how the same two arrays might be put in order using a different sorting method.

The idea behind a tag sort is to use a separate array of "pointers" to the strings, and to sort the pointers so they reflect the order the strings should be in. Let's introduce an array of pointers, or "tags," called T. Each element of T is simply a number that refers to an element of N$. T is initialized so that T(1) = 1 and therefore points to the first (unsorted) name in N$; T(2) is set to 2, and so on. Then the tag sort can begin.

It works much the same way a regular sort works, in that it searches through

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the names to find the one that's alphabetically first. But instead of swapping the first and fourth elements of both the N$ and A$ arrays, it swaps the first and fourth *tags* instead. By referencing the names in N$ through the tags, they are sorted indirectly by changing the order of the tags.

Once the tags are ordered properly, you can print the names in alphabetical order, even though the names are never physically sorted! If this seems confusing, look at the unsorted names again, but this time along with the appropriately ordered tags:

```
N$(1): SMITH   T(1): 4
N$(2): JONES   T(2): 3
N$(3): BROWN  T(3): 2
N$(4): ADAMS  T(4): 1
```

After "sorting," the first tag (T(1)) has a value of 4, which is a pointer to N$(4). The value of N$(4) is Adams, which is the name you'd expect first in an alphabetized list. In addition, A$(4) is the corresponding address.

The second tag (T(2)) is 3, which points to the second alphabetized name (Brown), and so on. To see the names and corresponding addresses in alphabetical order, you simply print them indirectly in the order specified by the tags, instead of the order in which they're stored in the N$ and A$ arrays:

```
100 FOR I = 1 TO 4
110 PRINT N$(T(I)), A$(T(I))
120 NEXT I
```

This program gives you hard copy directory listings for your most frequently used disks.

In the disk directory program, you shuffle tags around instead of having to move every element in each of your three information arrays (FX$, FT$ and FL). See if you can figure out how the sort works by studying lines 580 through 610 of the listing. (The array of tags is called TT.)

Once the sort is complete, the program is ready to output the disk directory information. Line 270 opens a channel to the printer, and actual printing begins at line 280. Throughout this part of the program, I have avoided the use of graphics characters in Print statements, because I think it makes it harder to type the program in from a listing. Where a graphics character is needed, the program uses the CHR$ function instead.

For example, part of line 280 says "PRINT#3,CHR$(192)". CHR$(192) is the horizontal bar you see when you hold down the shift key and press the * key, but when you see that character on a listing and then try to find it on the keyboard, you may not be able to decide between [SHIFT *], [SHIFT C], [SHIFT D] or [SHIFT E]. By using the CHR$ function, you don't have to worry about exactly which combination of CTRL and/or shift keys you must press in order to type the program in correctly.

The disk directory information is printed by lines 280 through 470. There is nothing particularly tricky about this section of the program; it simply formats the data from the three information arrays into two columns and sends the formatted lines to the printer.

Try this easy program. It takes only a few minutes to make hard copy directory listings for your most frequently used disks, and you'll be surprised at how useful the listings are. Have fun! R

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Risk Takers, Beware

Stop disking around with important programs. Here's a disk copy program that takes all the risk out of copying disks and gives you a little backup insurance.

By John R. Olsen, Jr.

RUN It Right
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disk drive

Address author correspondence to John R. Olsen, Jr., PO Box 181, Newberg, OR 97132.

Owners of the 1541 disk drive know that some programs cannot be copied to another disk by normal means. Here is Program Copier, a disk utility that will help you overcome the problem.

A program in Basic can be loaded from disk and then saved back to a *different* disk inserted in the drive. This works with some machine language programs as well, but not with most—and not with data files.

New 1541 disk drive owners often want to copy onto other disks the DOS WEDGE that comes free on some program disks (bonus pack, editor/assembler, and so on). This wedge comes in two parts: the actual machine language program itself (filename DOS 5.1) and a very short "loader" program written in Basic (filename C-64 WEDGE or DOS WEDGE 64).

The "loader" program is easy to copy onto a different disk, as are all Basic programs. You can't use the same method to copy the machine language program, but Program Copier will do the job for you.

Memory Maneuvers

The general principle of Program Copier's operation is simple. You first copy the program from the disk into an array in memory. Then swap disks and copy the array contents onto the second disk. The array in Program Copier can hold up to 150 blocks.

You can run this program on a VIC-20 as well as a C-64, but because the VIC has less memory, only smaller programs can be copied. If you want to try it on the VIC-20, you'll have to adjust the size of the array in line 100 so you don't get an out-of-memory error.

Program Details

Line 100 sets aside room for 150 blocks in the A$ array. (Each block contains 254 bytes of program data.) This array is where the program you are copying will reside while you swap disks in the disk drive. The other lines with numbers less than 1000 need no explanation.

Lines 1000 and 1100 open the command channel to the drive and open the disk file that you will be copying. Line 1200 checks for any disk errors.

The lines in the 2000s read the program one byte at a time and put it into blocks of 254 bytes, stored in the A$ array. Line 2100 gets the byte. Line 2300 adds it to the block in the array.

Line 2400 checks the status to see if you have reached the end of the program. If you have, the file is closed. If not, the counter I is incremented. If the block is full, then a new block is started.

Line 2200 takes care of a special case in reading a byte from the disk. If the byte is a zero, it is read by the Get # 2 statement as a null (empty) string. When writing this back to disk, the Print# 2 statement writes nothing, and your program has suddenly lost an important byte.

To correct this problem, any zero is changed to a character string of zero when written to the block. Then, when it is written back to disk, it actually writes the zero as desired.

The lines in 3000s prompt you to swap disks and then initialize the new disk. If you want to copy the program to the new disk under a new file name, simply insert the line

```
3300 INPUT "NEW FILE NAME";N$
```

Then you can use a different file name. Or just press the return key to leave it unchanged.

The lines in the 4000s open the file to be written and check for any disk errors.

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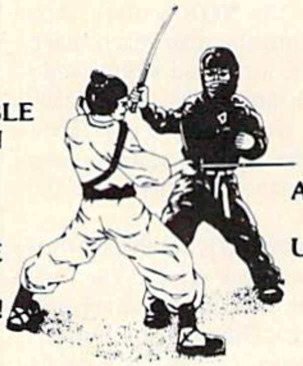

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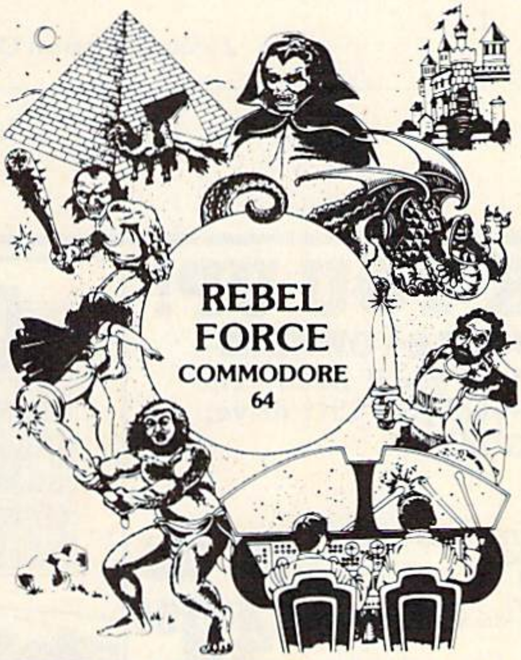

YOU ARE THE ONLY ONE LEFT TO HELP - PLEASE SAVE US

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This disk utility may be slow, but it sure will copy your programs for safekeeping.

The lines in the 5000s actually copy the program onto the disk. Each block is read from the array and written onto the disk in the same order as originally read. This is done with a For/Next loop. Then the file is closed—along with the command channel—and the program ends.

The lines in the 6000s are the subroutine for checking disk errors. The program checks the command channel, and if it finds no error (EN = 0), it returns to the main program. Otherwise, it prints the error number, message, track and sector, closes the file and ends.

The actual execution of the program is rather slow, since it has to be read one byte at a time. The second half of the program, where the copy is made, goes much faster, because entire blocks (disk sectors) are being written. An even faster version could be written in assembly language, but that's an exercise for the more advanced programmer. Ⓡ

```
100 DIM A$(150)
200 PRINT"{SHFT CLR}PROGRAM COPIER"
210 PRINT
300 INPUT"INSERT SOURCE DISK, RETURN"; A$
310 PRINT
400 INPUT"FILE NAME"; N$
410 INPUT"FILE TYPE (S,P,U)"; F$
420 PRINT
1000 OPEN 15,8,15
1100 OPEN 2,8,2,"0:"+N$+","+F$+",R"
1200 GOSUB 6000
2000 I = 1 : J = 0
2100 GET#2, A$
2200 IF A$ = "" THEN A$ = CHR$(0)
2300 A$(J)=A$(J)+A$
2400 IFST<>0THENCLOSE2:GOTO3000
2500 I=I+1:IFI>254THENI=1:J=J+1:PRINTJ;
2600 GOTO2100
3000 PRINT
3010 PRINT
3100 INPUT"INSERT DESTINATION DISK, RETURN"; A$
3200 PRINT#15, "I"
4000 OPEN 2,8,2,"@0:"+N$+","+F$+",W"
4100 GOSUB 6000
5000 FOR X = 0 TO J
5100 PRINT#2, A$(X);
5200 NEXT X
5300 CLOSE 2
5400 CLOSE 15
5500 END
6000 INPUT#15, EN, EM$, ET, ES
6100 IF EN = 0 THEN RETURN
6200 PRINT"DISK ERROR"
6300 PRINT EN; EM$; ET; ES
6400 CLOSE 2
6500 CLOSE 15
7000 REM
7001 REM                JOHN OLSEN
7002 REM                P.O. BOX 181
7003 REM                NEWBERG, OR 97132
```

Listing of Program Copier program.

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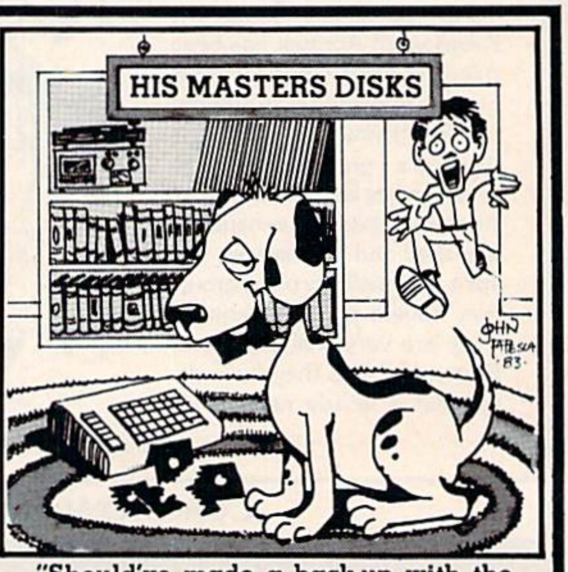

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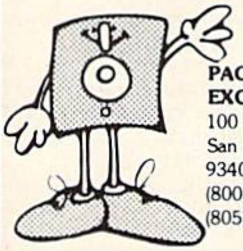

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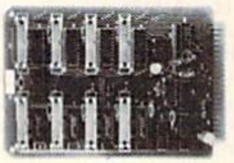

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Continued from page 20.

program flow makes sense.

Another test is to consider the source. Some authors, including Jim Butterfield and myself, try desperately to assure accuracy in memory maps we prepare. On the other hand, some resources are known for the unlikeliness of anything they publish working without corrections.

One other factor is Commodore itself. Since new ROMs keep appearing, it is difficult to cover all variations.

Q: What are some good beginning books on machine language for the 6502?

Herb Gross
Elgin, IL

A: Perhaps you could read Richard Mansfield's *Machine Language for Beginners* for now. It is a current bestseller and quite readable. Two better books are forthcoming, but I can't name the authors or publisher yet.

Q: A friend of mine has numerous disks, which are programmed to run on his Zenith computer, under CP/M. He will let me copy these if I can use them on my C-64. Do you know of a way this can be done?

Tom Simmons
Smyrna, GA

A: One of the persons who developed CP/M for the 64 has provided me with a suitable program for transferring files from a standard CP/M drive (8-inch, single-sided, single-density, IBM format) to a 64 CP/M disk. If you have programs in that format, I can convert them. However, they may still not run properly, due to the limited memory available in the 64 version of CP/M and its non-standard (for CP/M) 40 column screen. Unfortunately, since the time involved is great, I have to ask $30 for each C-64 disk created. Further, I can't help you with copyrighted programs you haven't bought.

A better approach might be to experiment with connecting your 64 to the Zenith directly, via your user port RS-232 lines and a matching port on the Zenith. However, this may require some knowledge of Z80 machine language. Are you beginning to realize why Commodore didn't see much point in rushing CP/M into production for the 64? ®

Q: Why can Apple computers initialize a disk faster than 1541s?

Herb Gross
Elgin, IL

A: Two reasons come to mind. First, there is much less usable space on an Apple disk to format. Second, the 1541 was designed to sell far more cheaply than an Apple disk system, and in the process some things were left out, such as the large RAM buffers of Commodore's other disk drives.

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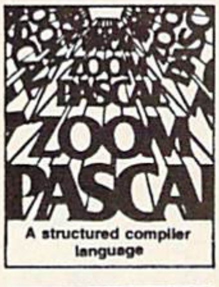
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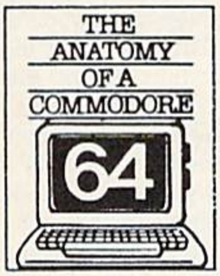
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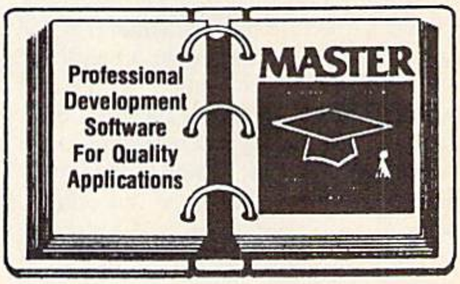
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Continued from p. 51.

African and Latin rhythms, while Template 2 has new wave and rock scores and sounds. Since they're both overlay programs, they won't work on their own, but combined with the Module 1 disk, they provide additional music scores and synthesizer presets that you can use to develop your own creations.

Waveform makes the MusiCalc system available in two ways: you can purchase each module independently, as your needs expand; or you can purchase what they call their Professional System, a more economical package deal that includes Modules 1, 2 and 3, as well as the two overlay Templates.

The documentation supplied with Module 1 is first-rate, leaving nothing to be desired as far as thoroughness and explanations go. The 65-page manual provides a wealth of information on music theory and electronic music synthesis. It covers every aspect of operation and control of MusiCalc, and it's written in an understandable and user-friendly manner.

The MusiCalc system is complex. Although it *can* be used by a child or musical novice, I feel it is best suited for the serious amateur, music student or professional musician who is willing to spend a lot of time with the program. There's a section in the manual that will get you up and running in a couple of minutes. But to fully enjoy the features of the system and get the most out of it, a thorough reading and rereading of the manual is required, as well as the investment of many hours of experimentation.

As I mentioned earlier, it's a heavyweight package that will transform your C-64 into an incredible sound synthesizer and music machine. This is without a doubt the most flexible and comprehensive music/sound package for the C-64 on the market so far. It will accommodate your musical needs, no matter what they are.

One final point that's worth mentioning is the packaging. Waveform uses the "record album" package similar to the one used by Electronic Arts. The disk, however, is a work of art in itself. Rather than the mundane black disk envelope we're so used to seeing, MusiCalc disks are in technicolor envelopes.

The illustrations on these disks are colorful and innovative; I've never seen anything like them before. The protective jacket is made of clear plastic, instead of paper, thus allowing the artwork on the disk to be seen, even when not in use. This novel idea also makes the modules a snap to pick out when you flip through your disk file. Very nice touch, Waveform!

Music Writer 64

M'Soft Corporation has produced Music Writer 64, a disk-based music program for the C-64. Music Writer 64 allows the entry, editing and playing of three voices, control of the SID chip during play for tonal colorations, saving the compositions to disk and printing sheet music of the score to your printer.

All musical signatures, notes, rests, etc., are entered through the keyboard in the Write mode. The Play mode allows editing and modification of the tonal qualities of the composition. Eight preset sounds are activated upon boot-up of the program, and you control them by using the function keys. There are also provisions for disk utilities, such as formatting and scratching.

An excellent feature of Music Writer 64 is the inclusion of help screens. The user's manual is thorough and concise, and provides full descriptions and explanations of the operation of the program. Essentially, these help screens are quick electronic command reference cards. They provide an on-line directory of commands for the various modes of the program, and I found them to be enormously helpful during composition and playback.

The synthesizer screen allows total control of the sound of the composition. Wave form, pulse, synch, ring modulation, ADSR, speed and other settings can be set or changed, and a myriad variety of setting combinations allows for unlimited sounds and tonal colorings.

Some examples of the sounds that can be created are presented in the sample selections, included on the disk. Another unique feature is the Verify function of the program, which automatically verifies all loads and saves to ensure everything's working as it should.

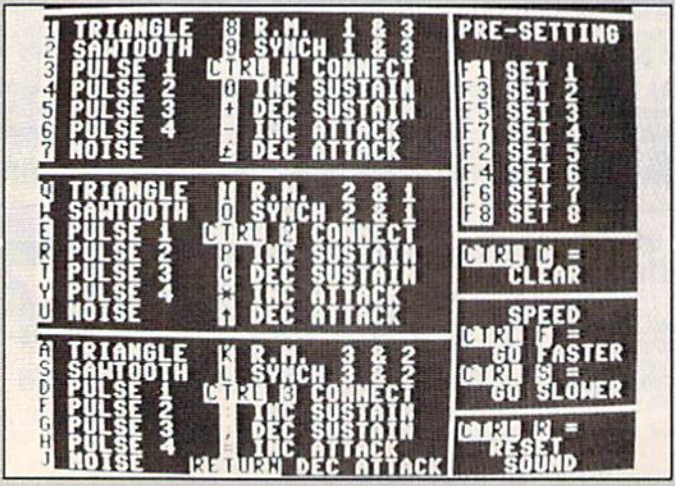
This program is one of the easier music/synthesizer packages to use. To enter music, you must make logical decisions: choose a clef for each voice, enter the note name, the octave (1, 2 or 3) it is to be in and the duration of the note. Sharps are represented by a + sign, flats by a − sign and naturals by a £ sign.

Rests are entered by hitting the R key, followed by the duration value. Clefs may also be changed at any time during a composition, which also adds to the flexibility of the program as a creative tool.

Everything's laid out in very logical fashion, and this straightforward approach, combined with the help screens, makes both learning and using the program easy and fast.

Music Writer 64 will also print out your compositions on your line printer. For this function to work properly, you must use a Commodore 1525, 1526 or 810 printer, or a printer that will totally emulate one of these (there are several emulator interfaces available to make your printer act like one of the Commodore models).

Once the program "thinks" it has a Commodore printer on-line, the quality of the printed sheet music is excellent. The printout process is somewhat slow-



```
1 TRIANGLE   8      R.M.   1 & 3    PRE-SETTING
2 SAWTOOTH   9      SYNCH  1 & 3
3 PULSE 1    CTRL 1 CONNECT         F1 SET 1
4 PULSE 2    0      INC SUSTAIN     F3 SET 2
5 PULSE 3    +      DEC SUSTAIN     F5 SET 3
6 PULSE 4    -      INC ATTACK      F7 SET 4
7 NOISE      £      DEC ATTACK      F2 SET 5
                                    F4 SET 6
Q TRIANGLE   I      R.M.   2 & 1    F6 SET 7
W SAWTOOTH   O      SYNCH  2 & 1    F8 SET 8
E PULSE 1    CTRL 2 CONNECT
R PULSE 2    P      INC SUSTAIN     CTRL C =
T PULSE 3    @      DEC SUSTAIN        CLEAR
Y PULSE 4    *      INC ATTACK
U NOISE      ↑      DEC ATTACK         SPEED
                                    CTRL F =
A TRIANGLE   K      R.M.   3 & 2      GO FASTER
S SAWTOOTH   L      SYNCH  3 & 2    CTRL S =
D PULSE 1    CTRL 3 CONNECT           GO SLOWER
F PULSE 2    :      INC SUSTAIN
G PULSE 3    ;      DEC SUSTAIN     CTRL R =
H PULSE 4    =      INC ATTACK         RESET
J NOISE      RETURN DEC ATTACK         SOUND
```

Music Writer 64.

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er than some of the other programs reviewed here, but this shouldn't be a primary consideration in making your decision for purchase. It's still infinitely faster than penning in the notes by hand on staff paper!

All in all, Music Writer 64 is a versatile program that combines extensive features, synthesizer controls and printing functions in a user-friendly package. It's one of the better all-around programs for the computer musician, whether a beginner or an accomplished virtuoso.

Note Pro II

Note Pro II is a complex sound and music synthesizer program from Electronic Lab Industries. When it is combined with the Note Pro Bridge, another program on a separate disk, musical creations and sound effects may be combined with your own Basic programs by performing a SYS call to activate them. Neither of these programs allows printing out your creation in musical notation on a line printer.

The main program, Note Pro II, supersedes Note Pro I, which is a simple music editor. NP-II adds many features, including the ability to transpose by octaves, a full eight-octave range for each voice, control of the ADSR, wave shape and filter settings, high-speed play of up to 450 notes per second (useful for arcade sound effects) and file-joining capabilities, using disk or cassette files. In addition, you can arrange musical compositions in any sequence, all note durations are available and you can select legato or staccato for each note.

The user's manual is complete and thorough, and it fully explains all notation, entry and control settings. I can't really call this system user-friendly, though; it takes a lot of reading and practice to get proficient at using the features. In fact, I found Note Pro II to be one of the more cumbersome music programs I reviewed.

All entry is accomplished through the keyboard, but it's not done in the standard music-notation format. If you're interested in tonal variety and the creation of sound effects to be used with your other programs or games, then perhaps the extra effort needed to utilize this package may be worthwhile for you.

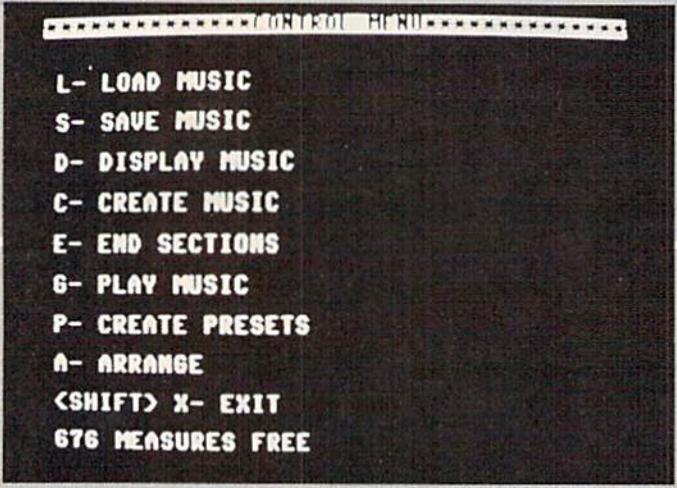
The Note Pro Bridge is a separate disk containing copyable routines in machine language that can be incorporated into your own Basic programs for the addition of music or sound effects. This is a strong point for Note Pro, since virtually any program is improved by adding sound effects or audio prompts.

The Bridge program is intended to be used in conjunction with Note Pro I or II— you first have to create the sound effects or music, and save them either to disk or tape to create a sound file. The Bridge utilizes these sound data files to integrate the sound into your program through the SYS command.

Control register values are Poked into memory and then called as needed from within the program. The bridge is interrupt-driven, so you can add it to programs already written or incorporate it into a program you're in the process of creating.

Note Pro II and the Note Pro Bridge have extensive applications and capabilities. They are complex to use, however, since the controls are sophisticated. In light of this fact, your intended use will determine whether this is the right package for you.

If you wish to create and compose musical scores easily and print them out in the form of sheet music, then Note Pro is not for you. If, however, you intend to incorporate your musical creations into your applications or game programs, then Note Pro II and the Bridge are perfect for these purposes.



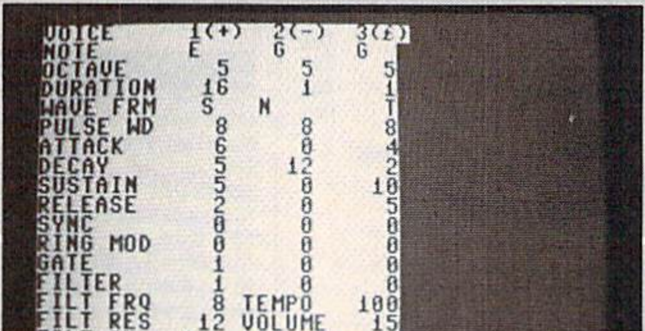
```
...............CONTROL MENU...............

L- LOAD MUSIC
S- SAVE MUSIC
D- DISPLAY MUSIC
C- CREATE MUSIC
E- END SECTIONS
G- PLAY MUSIC
P- CREATE PRESETS
A- ARRANGE
<SHIFT> X- EXIT
676 MEASURES FREE
```

Note Pro II and Note Pro Bridge.

Synthy-64

Synthy-64, from Abacus Software, is yet another music and sound-synthesis program for the C-64. Although it doesn't make any provision for printing out sheet music on your line printer, it does contain other useful features, such as an interactive display of a song's lyrics, with musical accompaniment, should you desire to sing along. The program is available on either disk or tape, and you can also store your creations on either of these media.



```
VOICE        1(+)  2(-)  3(£)
NOTE         E     G     G
OCTAVE          5     5     5
DURATION       16     1     1
WAVE FRM      S   N         T
PULSE WD        8     8     8
ATTACK          6     0     4
DECAY           5    12     2
SUSTAIN         5     0    10
RELEASE         2     0     5
SYNC            0     0     0
RING MOD        0     0     0
GATE            1     0     0
FILTER          1     0     0
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FILT RES       12 VOLUME   15
FILT CTL     H    KEY  #    1
LINE 1060 POS.    29

STOP KEY
LINE 1060 POS.    29
READY.
```

Synthy-64, for the C-64.

Synthy-64 is fairly easy to use, as inputting follows a logical pattern. For example, if you wish to play a C note, you type in C; to denote duration values of the note, a slash followed by the value is input; e.g., C/4 would give you a C quarter note. Most other entry utilities follow a similar pattern, and getting the hang of using it takes but a short time.

I don't mean to oversimplify Synthy-64; it still takes a bit of time to learn the command structure and read the manual, but compared to some of the other systems already mentioned, it's fairly simple to learn. Mastering all the controls and functions, on the other hand, may take some doing.

The program lets you tailor the SID chip's controls to extract the sounds you want. You can control waveform, pitch, envelopes, filter and modulator settings, and in so doing can obtain an infinite variety of sound. These controls aren't as easy to use as you might like, but they're workable and can produce some nice results.

There is no quick-reference chart, which would be useful for the cumbersome control settings, so you'll probably find yourself referring frequently to the manual, at least in the early stages. A provision for line-printing sheet music would have been nice, but this just isn't the case.

To sum it up, Synthy-64 is one of the better compromise music-and-sound programs. It will allow a great variety of sound generation for all three voices, it permits saving your compositions to either disk or cassette, and it provides an interactive graphics display of text (lyrics) along with music and control settings.

If you absolutely need to print out your scores, you should look elsewhere. If you don't need the printout capability and would like to experiment and investigate the limitless variety of sounds that can be synthesized, you'll probably like Synthy-64.

Kawasaki Synthesizer

This is a very comprehensive music package that lets you compose, record, play and print out your musical creations. This package contains the name of the designer and author of the program, Ryo Kawasaki, who is a noted Japanese jazz guitarist with over a dozen album releases to his credit.

As with all the other programs (except the joystick-controlled Music Construction Set), Kawasaki Synthesizer is keyboard-controlled, both for inputting music and sound-control settings. The program is marketed on two disks, and the documentation supplied with it is exhaustive. Four stars must go to Mr. Kawasaki for thoroughness—you can't help but learn quite a bit about both music and sound synthesis on the C-64 after reading through the manual.

A very thorough study, not just a casual reading, of the manual is required if you want to make the most of the intricacy and flexibility that the Kawasaki Synthesizer offers. A large portion of the manual is in the form of a tutorial on music theory and practice as well as synthesizer nomenclature. It offers a wealth of information.

The set contains Easy Beginner and Easy Pro. The latter is the more complex and does just about everything conceivable with the SID chip.

A three-voice sequencer has been incorporated into the software, so that passages of the composition can be repeated. A two-voice sequencer is also provided so that you can play along to create or improvise the third voice while listening to two others. This is a handy feature when you're developing harmony parts or chord structures.

Another strong point is the six-octave range that's available for your scoring needs. The excellent graphics display simplifies (to some extent) inputting music and control settings.

The print-out function is superb, and apart from the vast flexibility of tone and pitch ranges possible, this is a real strong point for Kawasaki's Synthesizer set. Although intended to be used with a Commodore printer, an emulator interface will produce equal results on most printers, and the print quality is excellent.

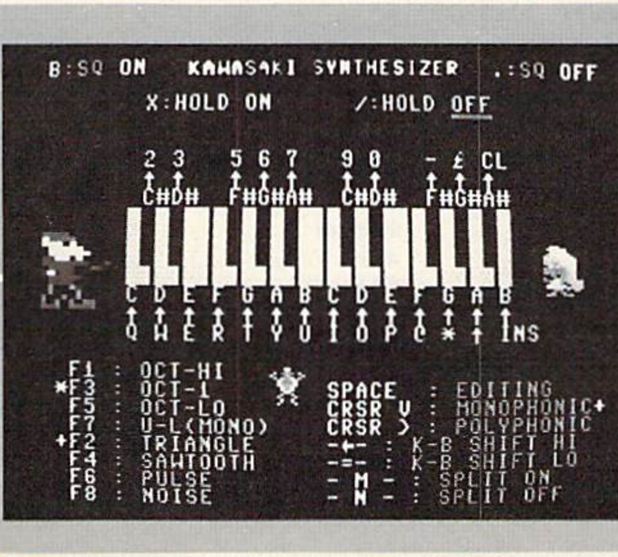
Another plus for Easy Pro is the "real-time sequencer track," as it is called in the manual. I found this to be particularly useful in laying down rhythm tracks, such as drum beats and other percussion sounds. It's a real boon in adding color and depth to your compositions, and it will do double duty to keep time for you if you're practicing on another instrument as well. Very realistic percussion sounds are possible using this feature of the program.

I recommend Easy Pro for the serious user who isn't easily intimidated by fat user manuals and who doesn't mind some extra work during the input and editing stages to extract precisely the type of sound he or she wants to produce. The many illustrations included with the text in the manual aid in gaining proficiency at using the program. This is a serious program with excellent capabilities for the serious musician.

For the amateur composer, there's Easy Beginner. As the name implies, Easy Beginner is a simple program that will get you ready to compose and play music in a hurry. This program uses eight different screens that demonstrate the piano keyboard screen and the available sounds, give you access to 21 pre-set sounds and 13 pre-set songs, and let you change the wave forms and octaves.

Other options let you play along with pre-programmed music patterns on the "piano keyboard." By combining the pre-set voices and changing wave forms and octaves, you can create over 500 pre-set sounds with this program. Ninety percent of the documentation to operate Easy Beginner is on the screen for easy use.

The Kawasaki Synthesizer program will also contain a songbook of today's most popular songs from artists such as Billy Joel, Lionel Ritchie, Michael Jackson, Duran Duran, The Police and others. With this songbook, you'll be able to program complete compositions



```
B:SQ ON   KAWASAKI SYNTHESIZER   .:SQ OFF
       X:HOLD ON        /:HOLD OFF

       2 3   5 6 7   9 0   - £ CL
       ↑ ↑   ↑ ↑ ↑   ↑ ↑   ↑ ↑ ↑
       C#D#  F#G#A#  C#D#  F#G#A#

      C D E F G A B C D E F G A B
      ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑
      Q W E R T Y U I O P @ * ↑ INS

  F1 : OCT-HI
 *F3 : OCT-1           SPACE   : EDITING
  F5 : OCT-LO          CRSR V  : MONOPHONIC+
  F7 : U-L(MONO)       CRSR >  : POLYPHONIC
 +F2 : TRIANGLE        -←-  : K-B SHIFT HI
  F4 : SAWTOOTH        -=-  : K-B SHIFT LO
  F6 : PULSE           - M - : SPLIT ON
  F8 : NOISE           - N - : SPLIT OFF
```

Kawasaki Synthesizer.

into the Easy Pro program and dump them onto disk to save and show to your friends.

The distributor of this program, Sight & Sound International, Inc., will also be manufacturing a keyboard overlay for the 64 ASCII keyboard. The keyboard overlay will consist of a two-octave, organ-type keyboard that easily snaps over and allows you to play the C-64 as if it were a portable keyboard (like a Casiotone).

Music Machine

Even Commodore has gotten on the music-synthesis bandwagon. The Music Machine is a music-synthesizer package on a ROM cartridge, instead of the usual cassette or disk formats. Cartridge-load programs have certain advantages and drawbacks as against tape or disk programs, and we'll examine them right now.

The most obvious advantage is that the cartridge offers "instant-on" readiness. In other words, once you insert the cartridge into your C-64 and turn the power switch on, that's it—you're ready to roll without having to wait for the program to load.

A drawback of the cartridge is that there is only so much data that can be crammed into it, so there has to be some limitation on the complexity of the program. Such is the case with Music Machine—it is a compromise of features.

Basically, it's an easy program to use, with a minimum of effort needed to produce music. Input from the keyboard controls three voices. The function keys control rhythm and tempo.

A pitch control is also provided so you can "tune" your C-64 to play along with the radio or a record, and you even have limited control over the sound of the music by adjusting the waveform, effect and octave controls.

In typical Commodore style, the instruction manual is user-friendly, and you can learn everything you need to know in just a few minutes, since it's only eight pages long. No lengthy technical explanations are given, just the nitty-gritty information on what the controls are and do and how to handle them.

For this reason, it's a good choice for those of you who can't be bothered reading a lengthy dissertation on how to use the software. Just plug Music Machine in, turn it on, breeze through the manual and start making music (or noise).

The major drawback of the Music Machine is that there's no provision to save your compositions to disk or tape. Why this feature wasn't included is puzzling, since it wouldn't have taken up much more memory in the cartridge or have increased the price significantly.

This lack of capability to preserve your music becomes painful when you've spent a long time getting the harmony of the three voices just right in a song and setting the tempo and sound to your liking. You'd like to save it—but you can't do it! When you shut off your C-64, your music goes bye-bye and won't be heard again unless you key in the notes and settings all over again.

For this reason, I don't imagine the Music Machine is going to appeal to the more serious musicians. It's a really good starter program for younger musicians, though, and should provide lots of fun with a minimum of effort.

Music Composer

Commodore must have realized the inherent shortcomings of their Music Machine cartridge, so they came out with the Music Composer. Once again, this is a ROM cartridge, but this time they did add the provision for at least saving the composition to cassette. While the Music Composer isn't heavy-duty as far as music and sound packages go, it's definitely a few cuts above the Music Machine.

The user's manual is twelve pages long, and is devoid of frills—just matter of fact stuff here that will get you using the program in short order. Again, since it's ROM-based, there's no wait while you load the program; you simply insert the cartridge, turn on the C-64, and off you go. All note entry is done by keyboard.

To keep up with their tradition of user-friendly software, virtually everything on the Music Composer is menu-driven, which greatly simplifies choosing sounds, voices and other variables. It includes a sample piece of music by Handel that gives a nice demo of what the program can do, and you're even given the option of changing the preset instruments, the filters and other tone controls to hear what effect these changes will produce in the sample piece. This is more useful than just reading about the controls' functions and trying to imagine the effects.

While the Music Composer still isn't in quite the same league as most of the other programs I've covered here, it's very easy to use, allows storage of your compositions for replay and editing, and is an excellent choice for those looking for a fun way to get their feet wet in the area of computer sound and music synthesis.

Manufacturers' Addresses

Music Construction Set
Electronics Arts
2755 Campus Drive
San Mateo, CA 94403
Disk, $40

Studio-64
En-Tech Software
PO Box 881
Sun Valley, CA 91352
Disk or cassette, $39.95

MusicCalc
Waveform Corp.
1912 Bonita Way
Berkeley, CA 94704
Disk, $74.95

Music Writer 64
M'Soft Corp.
12027 Pacific St.
Omaha, NE 68144
Disk, $69.95

Note Pro II; Note Pro Bridge
Electronic Lab Industries
100 West 22nd St., PO Box 7167
Baltimore, MD 21218
Note Pro II, cassette, $46.95
Note Pro Bridge, cassette, $24.95
(Add $3 each for disk)

Kawasaki Synthesizer
By Ryo Kawasaki
Distributor: Sight and Sound Int'l
3200 S. 166 St., PO Box 27
New Berlin, WI 53151
Two-disk package, $49.95

Synthy-64
Abacus Software
PO Box 7211
Grand Rapids, MI 49510
Cassette, $29.95; disk, $32.95

Music Machine; Music Composer
Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
Cartridge, $17.95 each

Magic Voice Module
Commodore Business Machines
1200 Wilson Drive
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VIC Music Composer
Thorn EMI
1370 Ave. of the Americas
New York, NY 10019
Cartridge, $19.95

Fun With Music
Epyx Computer Software
1043 Kiel Court
Sunnyvale, CA 94086
Cartridge, $30

VIC-20 Speech Synthesizer
Maxtron
1825A Dursee Ave.
El Monte, CA 91733
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A Basic Excursion Beyond the Manual

By Jeffrey Mills

In this installment, we say goodbye to an old friend, the Catalog Listing program we have watched grow and develop over the last few months. In the process, we'll make some new acquaintances: Messrs. Input Statement, If...Then Statement and Restore Statement.

We covered some of the basics of C-64 programming in the first three articles of this series. Now, we'll work on making the Catalog Listing program, which we've been developing, more controlled. If you've missed the first three articles, Listing 1 shows the program in its current state.

The Countdown Begins

First, we'll discuss using a variable as a counter to keep track (or count) how many times we've done something.

When you assign variables in a program, always use the same variable for a counter, so as to prevent wasting memory by needlessly storing a large number of variables that won't be reused. You can call this counter variable any name, but for this program, we'll use X. To make X count for us, we'll use this assignment statement:

```
LET X=X+1
```

Now, each time the assignment statement is performed, 1 will be added to the value stored in the file cabinet called X in memory. What this Basic statement means in English is, "Let the value stored in X equal the value stored in X plus 1." We'll use a counter in our Catalog program to limit the catalog listing entries on the screen to ten at one time. This allows us to have more than ten entries stored in our Data statements without overflowing the screen's boundaries. We'll call each set of ten items listed on the screen a page. Type:

```
58 LET X=0
62 LET X=X+1
80 IF X < 10 THEN GOTO 60
```

Line 58 ensures that our counter variable contains a 0 before beginning to count. This is called initialization of a variable. Although Basic usually initializes variables to 0 for us, you may sometimes need to initialize a variable to a value other than zero. Initialization of the variable ensures that it contains our intended value. It's a good practice to follow.

In the case of a string variable (one containing characters instead of numbers), the C-64 initializes the variable to a null, which is completely empty; it has a length of zero.

A blank, however, takes up space and has a length of one. Try not to confuse a null with a blank. Now, back to the counter.

Line 62 is the counter. Whenever this line is executed, the computer adds 1 to X, the value in the file cabinet.

Line 80 was replaced with a new line 80, which contains an If...Then statement. This line checks to see if our count has reached 10—if there are ten items listed on the screen.

If it's still less than 10, we'll go back to line 60 and print another catalog listing entry. If it has reached 10, we'll go to the next set of instructions without printing any more on this page.

Out With Your Input

If we want the computer to communicate with us after listing ten items (to ask us if we want to

---

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see more of the listing or to just end), we'll need to explore the Input statement.

The Input statement tells your C-64 to ask you a question and to take your response from the keyboard. It's a powerful command for programming question and answer type programs, and may also be used in games that are controlled by the keyboard. In more advanced programming, you'll learn to use the Input statement with files, too.

A prompt directs your computer to ask you a question or instructs you to press a key. (For example, "ENTER ANSWER:" or "PRESS Y FOR YES, N FOR NO.")

In the case of our program, why don't we have the computer prompt us:

"DO YOU WANT TO SEE THE NEXT PAGE (Y/N) ?"

Since the question requires a specific character or characters as the response (a Y or N), we should display the choices along with the question; for example, the "(Y/N)" in our Input statement.

The Input statement works with or without a prompt. If the actual prompt were very long, perhaps covering more than one line on the screen, we would use a standard Print statement to place the prompt on the screen. Then, on the following line, we'd simply use the Input statement to get the reply from the keyboard.

If we were to print the question as a separate statement, as we would if it were quite lengthy, and then if we were to specify only an input that does not include the question to be asked, the C-64 would supply us with a ?.

The Input statement may be used like a Print statement; you need only enclose the prompt within quotes, and the computer asks the question and waits for the answer all in one statement.

If we specify the prompt as part of the Input statement, the C-64 prints our question on the screen and supplies us with a ?.

It's important to remember that the question mark (?) appears. The computer doesn't know whether or not our prompt includes a question mark, specified within quotes, and it would place its own question mark at the end of the prompt. Thus, we'd have two question marks; not quite what we want.

In either case, the flashing cursor appears after the prompt. The flashing cursor is the C-64's way of telling us it's waiting for an answer.

We'll use the method that includes the question in the Input statement. We should allow a blank line to print on the screen before we ask the question. Type:

```
84 PRINT
85 INPUT "DO YOU WANT TO
SEE THE NEXT PAGE (Y/N)";KB$
```

Let's investigate the syntax (the way you specify a statement) of the Input statement.

Notice how we used quotes to specify our question. Notice, too, how we followed the question with a semicolon (;) and a string variable name. The C-64 prints the character or characters between the quotes as the prompt on the screen, follows it with a question mark and then a flashing cursor. Our answer or response goes into the variable specified after the semicolon. In this case KB$.

> *The Input statement is a powerful command for programming question-and-answer-type programs, and may also be used in games controlled by the keyboard.*

We'll use KB$ as a standard variable for inputs like this one, which controls the flow of the program. We probably won't use the value in KB$ again, so why set aside in memory a separate file cabinet for something that's temporary? KB$ is a good choice since it implies keyboard; KB$ is a temporary input from the keyboard.

You don't have to limit inputs to strings. You could also ask for a numeric response.

Multiple items may be requested with the same Input statement. For example, you could use a prompt like "ENTER MONTH,DAY,YEAR(MM,DD,YY)." This input could be followed by the variables M, D and Y.

The first response from the keyboard will be entered into the variable M; the second into D; the third into Y. You can enter all your answers at once by typing: 4,15,84 in response to the prompt. The commas serve as delimiters (separators) and the 4 is placed in M, the 15 in D and the 84 in Y.

You could also use both string and numeric response in one input; for example, "ENTER NAME, AGE:". The variables used might be NM$ and A. The Input statement would look like this:

```
956 INPUT "ENTER NAME, AGE"; NM$,A
```

The response from the keyboard would be:

```
JOHN DOE, 15
```

If the response was incorrectly entered as:

```
15, JOHN DOE
```

NM$ would contain the characters 1 and 5 or 15. This works because a 1 and a 5 are both characters as well as numbers. However, when the computer tried to enter the characters "JOHN DOE" into the numeric variable A, an error would occur. The C-64 would print TYPE MISMATCH ERROR IN nnn.

nnn represents the line number where the error occurred. This is another instance illustrating the wisdom of a prompt designed to show the format in which the answer should be entered. In the case of our Catalog program, we can easily see that the computer expects a Y or an N in response to the question.

The Input statement is covered on pages 45–47 of the *Commodore 64 User's Guide*.

If our question requires a specific set of answers, like Y for yes or N for no, we should include an error check to be sure that only the requested responses are entered. In the case of our Catalog Listing program, we want to make sure that the answer is either a Y or an N.

If our answer isn't a Y or an N, we must repeat the question and ask for an answer again. The If statement for this is a bit more complicated than those we've previously used, because we must check on more than one condition (is it a Y or is it an N?).

If...Then

To check on more than one condition, we'll use the If...Then statement just like we would for a single condition, but we'll add either an And or an Or to the statement.

Use And when both of the conditions being checked must be true. Use Or when only one of the conditions must be true. You may use more than one And or Or in one If...Then statement.

If...Thens with multiple Ands and Ors will sometimes be difficult to set up, so, for now, we'll just stick to one And or Or in an If...Then. Once we've had more practice with Ands and Ors, we can move up to more complicated conditions.

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```
10 REM *** PROGRAM/TAPE CATALOG ***
20 REM *** WRITTEN BY: YOUR NAME **
25 POKE 53280, 12: POKE 53281, 0: REM *** SCREEN COLORS
    ***
30 PRINT "{SHFT CLR}"
40 PRINT"{CTRL 8}{14 SPACEs}TAPE CATALOG"
50 PRINT
52 PRINT"{COMD 6}TAPE", "PROGRAM"
54 PRINT"NO.", "NAME"
56 PRINT
60 READN,P$
65 IF N = -1 THEN GOTO 90
70 PRINT"{CTRL 4}"N,P$
80 GOTO 60
90 REM *** END OF LOOP ***
9000 DATA 101,GAME 1,101,GAME 2
9010 DATA 102,GAME 3,102,GAME 4
9020 DATA 103,GAME 5,103,GAME 6
9999 DATA -1,EOF
```

Listing 1. Catalog Listing program as developed through lesson 3.

```
10 REM *** PROGRAM/TAPE CATALOG ***
20 REM *** WRITTEN BY: YOUR NAME **
25 POKE 53280, 12: POKE 53281, 0: REM *** SCREEN COLORS
    ***
30 PRINT "{SHFT CLR}"
40 PRINT"{CTRL 8}{14 SPACEs}TAPE CATALOG"
50 PRINT
52 PRINT"{COMD 6}TAPE", "PROGRAM"
54 PRINT"NO.", "NAME"
56 PRINT
58 LETX=0
60 READN,P$
62 LET X = X + 1
65 IF N = -1 THEN GOTO 90
70 PRINT"{CTRL 4}"N,P$
80 IF X < 10 THEN GOTO 60
84 PRINT
85 INPUT"DO YOU WANT TO SEE THE NEXT PAGE (Y/N)";KB$
86 IF KB$ <>"Y" AND KB$<>"N" THEN GOTO 85
88 IF KB$ = "Y" THEN GOTO 30
89 IF KB$= "N" THEN GOTO 100
90 RESTORE
92 GOTO 60
100 PRINT "{SHFT CLR}" : END
9000 DATA 101,GAME 1,101,GAME 2
9010 DATA 102,GAME 3,102,GAME 4
9020 DATA 103,GAME 5,103,GAME 6
9030 DATA 104,GAME 7,104,GAME 8
9040 DATA 105,GAME 9,105,GAME 10
9050 DATA 106,GAME 11,106,GAME 12
9060 DATA 107,GAME 13,107,GAME 14
9070 DATA 108,GAME 15,108,GAME 16
9080 DATA 109,GAME 17,109,GAME 18
9999 DATA -1,EOF
```

Listing 2. Complete Catalog Listing program.

As this applies to the Catalog program, we only want to re-ask the question if the answer is neither Y nor N, so enter:

```
86 IF KB$ < > “Y” and KB$ < > “N” THEN
GOTO 85
```

Remember that if we're checking a string variable we must specify what we're checking inside quotes. The item specified inside quotes is called a constant or literal. If the variable is numeric, we'll still be able to use literals; they'll just be numbers instead of strings and won't be specified within quotes.

In such a check, we don't have to use literals for the comparison; we could use a variable. However, in our particular application we know that the response to the question should only be Y or N, so we use literals.

In the case of this check, as in the case of the If. . .Then in line 80, if the condition we specify after the If statement is true, our program will do what is specified after the Then statement in the same line. If the condition specified after the If statement is *not* true, the program will go on to the next line and ignore the statement after the Then statement.

Once the computer knows our response is a correct letter, we can tell it what to do if we want to see another page or if we just want to end. If we answer Yes—we want to see the next page—we must erase what is on the screen and then print the next page of the listing.

Since we want the headings to print, we can send the program back to line 30. The screen will clear, the headings will print and the next ten items in the Data statements will then be read and printed.

Remember that, by including line 65, we've already taken into account that we may run out of items to print.

If we answer No—we do not want to see any more—we can jump to a statement at the end of the program. We should probably have the screen cleared when we end, just to be neat about it.

To accomplish both of these checks, let's type in these lines:

```
88 IF KB$ = “Y” THEN GOTO 30
89 IF KB$ = “N” THEN GOTO 100
100 PRINT “[Shift-CLR/HOME]”:END
```

Previously, line 89 pointed to line 100, and 100 did not yet exist, so we had to add it. It contains the embedded Print command to clear the screen, and then it ends the program's execution.

Computer Restoration

It would be helpful if we could look over our game list by simply answering Y when we are asked if we want to see the next page.

Then, if the last page did not contain ten items, it would be helpful if we could tell the C-64 to go back and restart the list to fill up the rest of the last page.

The Restore command makes all this possible. It returns the pointer to the beginning of the Data statements and allows the program to start reading from the beginning with its next Read statement. The Restore statement does not, in itself, read anything. It just moves the pointer in memory so that we may access all of the Data statements again.

The Restore command is mentioned

on page 124 in the *Commodore 64 User's Guide*.

Where shall we use the Restore command in our program? If we were doing this listing by hand, ask yourself when we'd need to go back to start the listing over. We'd return to the start of the list when we find, with the check in line 65, that we have no more items to read at the end of the Data statements.

Let's add a Restore command to line 90 instead of the remark that is there, since we only want to end the loop when we answer N to whether or not we want to see the next page.

We'll put a GOTO after the Restore command so as to force the listing to continue until we answer N. This is called an unconditional GOTO.

We use the term unconditional if we want consistently to do something when we get to a statement. If there was a reason not to do something or a reason to do something (like in line 65), we'd say that the GOTO was conditional.

The GOTO in line 65 is conditional and the GOTO in line 90 is unconditional.

Let's make these changes to the program:

```
90 RESTORE
92 GOTO 60
```

We return to line 60 since the program must next get another item from the list in the Data statements. We'll follow through step-by-step to check if this is correct.

> *In the next article,*
> *we'll apply our knowledge*
> *to the design*
> *and coding*
> *of a simple*
> *interactive game.*

The headings are already on the screen at line 60, and perhaps we have several items already listed. We'll read the next item. Line 65 will check to see if the item we just read was −1, End Of File (EOF). If it was the dummy end data, we'll go to line 90.

Line 90 will move our pointer in the Data statements back to the beginning. Now comes the hard part! If we had returned to line 70 instead of line 60, we'd be printing a −1 for the tape and EOF for the program name. We should go back to read the next item to be printed from the beginning of the list.

Let's add a few more Data statements to our program, to be sure that we have more than ten items in the listing.

As always, with a new or developing program, make sure that the program is saved on tape or disk before it's tested. If there is an error which forces us to turn off the C-64, we can easily recover by simply loading in the program and correcting the error.

Now, let's run it to see how well our C-64 follows our instructions. (Listing 2 shows the finished Catalog Listing program.)

We've worked on this program for quite a while, and it's in good order. In the next article, we'll apply our knowledge to the design and coding of a simple interactive game. We'll also learn a couple of new commands that will help us develop a structured program and allow our computer to take a more active part in the game. R

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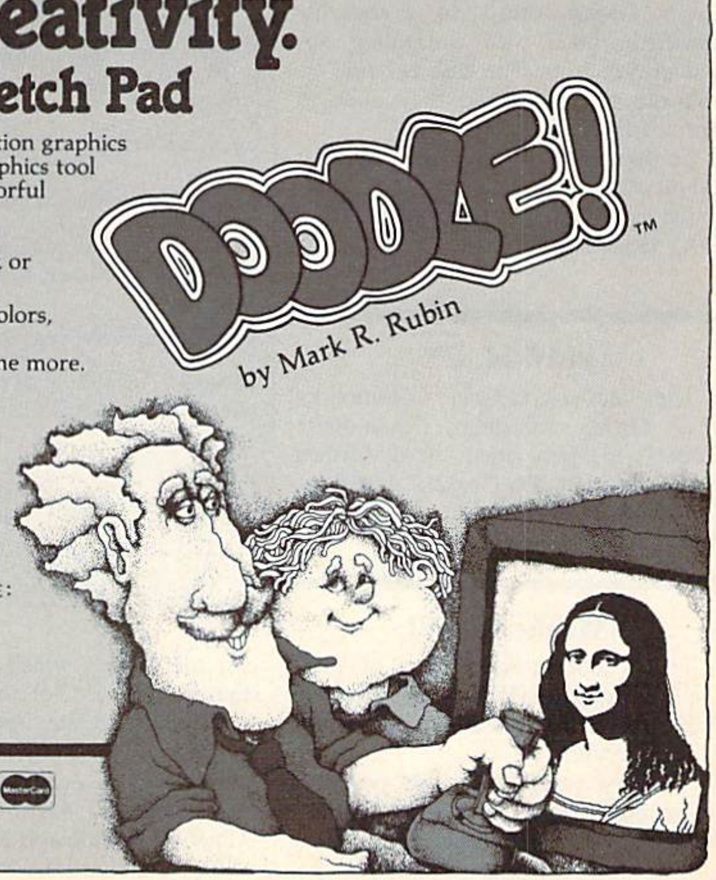

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They have active subsections for educators and hams, and they have a large public domain program library. The group is interested in contacting other user groups to exchange newsletters and public domain software.

For information, contact Jim Mathers, Club Coordinator, at 3021 Ben Venue Drive, Greensburg, PA 15601.

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Do you belong to a club that you want others to know about? Are you in the process of forming a club?

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RUN Amok

As you see, we're still RUNning Amok, but hoping to drastically reduce, if not totally stifle, the bugs that crawl into some of our programs. February's issue brought you slashed zeros, and in March our new printhead finally disposed of the O-0 problem. Again we apologize for the inconveniences the errors have caused you. We very much appreciate your calls and your understanding of our difficulties. Following are some remaining corrections for the January and February issues:

Item: A short listing was omitted from the answer to Bob Sullivan's question in February's Commodore Clinic (p. 15). The listing in full appears below.

```
100 OPEN 15,8,15
110 OPEN 1,8,2,"0:NAME,1,"+CHR$(RL)
120 GOSUB 230
130 B2=INT(NR/256)
140 B1=NR-256*B2
150 PRINT#15,"P"+CHR$(2)+CHR$(B1)+CHR$(B2)+CHR$(1)
160 GOSUB 230
170 PRINT#1,CHR$(255);
180 GOSUB 230
190 CLOSE 1
200 GOSUB 230
210 CLOSE 15
220 GOTO 260
230 INPUT#15,DS,DS$,ET,ES
240 IF DS >0 AND DS<>50 AND DS<>62 THEN PRINT DS$:STOP
250 RETURN
260 END
```

Item: In the listing of the Canyons of Zelaz program (January, p. 42), there are too many characters in line 1003. The solution is to abbreviate DATA by typing D shift A.

Item: In The Riddle of the Symbol Code program (January, p. 92), line 204 was inadvertently cut out of the listing. Here it is:

```
204 FOR QW=55296 TO 56319 : POKE QW,0 : NEXT QW
```

Item: Disk Master Revisited (February, p. 100) has a problem in line 2060. 16 SPACES should read 16 SHFT SPACES. Also, in line 430, "IO" should be "I0".

```
2060 Y=16:F$=LEFT$(F$+"{16 SHFT SPACEs}",16):RETURN
```

Item: In the February issue, Speedy Mosquito (p. 44) developed an itchy bug in line 1040. What looks like a 1 (one) isn't. It's an I (eye) that got scratched. It should read...POKE832+I...

Item: There were also problems with Database Deluxe (February, p. 48). There was one incorrect line and one omitted from the C-64 listing, and one incorrect line in the VIC-20 listing. Here they are:

The C-64 corrections:

```
400 OPEN1,1,1,T$:J=1:GOTO890

490 FORI=JTON-1:IFS$(I)="[SHFT *]"ANDS$(I+1)="[SHFT *]"
     THENI=N-1:GOTO510
```

The VIC-20 correction:

```
40 OPEN1,1,1,T$:J=1:GOTO89
```

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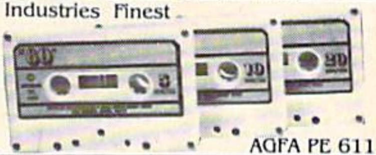

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Book Gallery

Compiled by Shawn Laflamme

Using the Commodore 64 In the Home

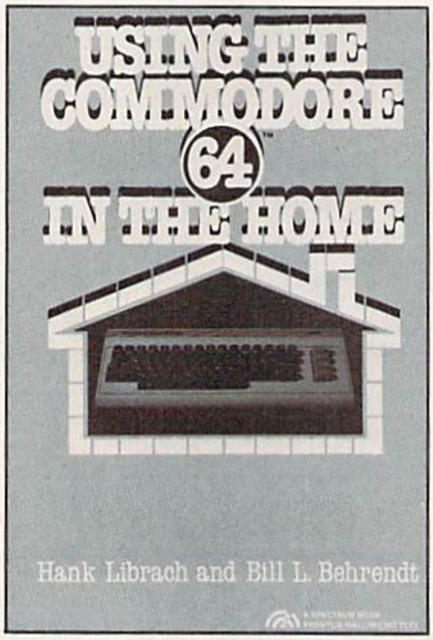
Hank Librach and Bill Behrendt
Prentice-Hall, Inc.
Englewood Cliffs, NJ 07632
Softcover, 100 pp., $10.95

Using the Commodore 64 in the Home is a collection of twenty Basic language programs written by Hank Librach and Bill L. Behrendt. These programs cover a whole range of home uses for the Commodore 64. Half of the programs deal with a diverse range of subjects, from "Nutrition Pack," an aid to counting proteins, calories and fats in the daily diet for a list of fifty foods, to "File Cabinet," a sequential data file organizer that is formatted to allow you to organize a personal library through the use of authors' names and book titles. This program is also designed to keep track of stamp collections, stocks, or any other sequential data file that you may wish to keep.

The second half of the book is devoted to the use of the Commodore 64 in the playroom and includes several conventional computer games. One program, entitled "Music Maestro," allows you to take advantage of, and better understand, the excellent sound synthesizer which is an integral part of the Commodore 64.

All of the first ten programs are written in Basic language constructions compatible with the Read-Only-Memory (ROM) of the Commodore 64. I tried typing, loading and running several of these programs and had no major problems.

The first ten programs are simple, practical and useful. Even the novice programmer would have little trouble typing, loading and running these programs. In fact, with just a few easily-made changes, the beginning programmer could adapt the programs to better satisfy his needs.



The second group of programs in the series of twenty is another matter, however. It's apparent that only a user with at least some advanced programming experience would be able to type, load and run the programs successfully. There are no explanations to help the new programmer understand how to produce many of the characters necessary to successfully type and list the programs into memory. The only clues to the keyboard manipulations necessary to produce the special Basic characters are in the index of the book, which, unfortunately, does not give any examples or further explanations.

In spite of the reservations I have expressed above, I believe that, even for the novice programmer, this book is a good investment that will provide endless hours of fun and learning for the Commodore 64 owner.

Gerald D. Gelvin
St. Simons Island, GA

Your Commodore 64

John Heilborn and Ran Talbott
Osborne/McGraw-Hill
2600 Tenth St.
Berkeley, CA 94710
Softcover, 444 pp., $14.95

Your Commodore 64 is a fully illustrated teaching guide, with something for both the beginner and advanced user. The clear, well-organized text covers everything from setting up your system and attaching peripherals to advanced programming techniques such as the inner secrets of using disk files, programming an "electronic organ" and designing custom characters for your printer.

In fact, except for the most sophisticated applications requiring extensive machine language programming, this book is probably the best all-around reference available for the C-64.

Osborne/McGraw-Hill books have always been characterized by a very clean layout packed with meaningful illustrations and useful programs. *Your Commodore 64* continues this tradition. For example, commands and programs that you can type into your computer are printed with a characteristic dot-matrix style to distinguish them from normal text. Figures throughout help explain how data is recorded on disk and how arrays are used, in addition to making programming concepts understandable.

Chapters 3 and 4 cover the normal Basic commands such as Print and Goto. But even if you know Basic, there are a number of valuable routines that can be incorporated into your own programs. For instance, several routines are dedicated to designing a form on the screen that can be filled in as data is entered. Color control, cursor positioning and data editing are all represented.

For those interested in game or graphics control, chapter 5 has the answers—complete with all the memory locations and code for reading joysticks and game paddles. This chapter even has a subroutine that turns the keyboard into a joystick.

As programs get more complicated, authors Heilborn and Talbott take the time to explain the tricky coding in detail. This way you really know the purpose of each statement and can modify programs for specialized needs.

Two features that set the Commodore 64 apart from other machines in its class are sprite graphics and a music synthesizer. *Your Commodore 64* contains one of the most complete descriptions of creating bit-mapped (high resolution) graphics, as well as showing how to control sprites and other video tricks.

These are complex subjects requiring direct access to memory locations in the video circuitry. Again, the authors do a fine job of explaining how various registers are used to control the Commodore 64's graphics and sound capabilities.

With any technical work, there are bound to be some errors, and I found a few in this book. Some were typos: "The key is lines 313–316. . . ." There are no line numbers in that range in the figure referenced.

In the graphics chapter, there is an important discussion about which colors can be combined with others for the best results. This information was apparently placed in a chart that is mysteriously absent from the book.

Other problems are simply errors of fact. There is a long discussion about using soft-sectored disks with the Commodore 1541 disk drive, stating hard-sectored disks cannot be used. In reality, the disk drive doesn't recognize the sectoring hole, so just about any type of disk will work fine.

Outweighing these few problems is the wealth of accurate data, such as a complete, 15-page memory map of how the Commodore 64 is organized. This information is important because many programs you write, even in Basic, will require looking directly at and changing numbers in the proper part of memory (Peeking and Poking). Want to know if one sprite collides with another? The memory map will tell you the location to check.

Also included in the appendix is a hexadecimal-to-decimal conversion chart (useful for machine language programming), and one of the clearest representations I've seen of the Commodore character sets, together with the associated numerical codes.

What sets this text apart from all other similar offerings is the quality and amount of information. Even considering the few miscues I found, *Your Commodore 64* is still one of the best references available for the Commodore 64.

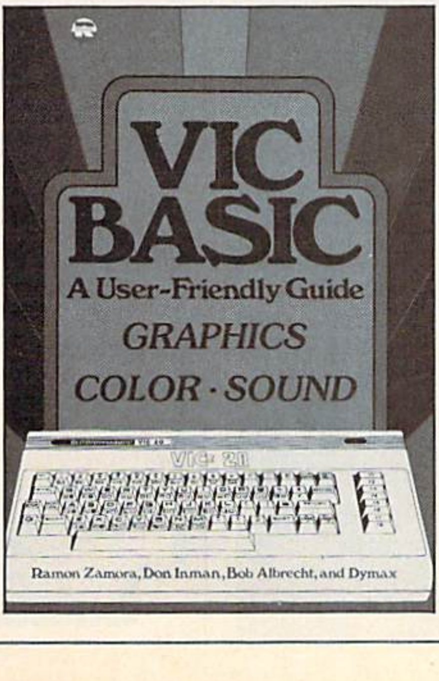
Michael Heck
Harleysville, PA

VIC Basic

Ramon Zamora, Don Inman,
Bob Albrecht and Dymax
Reston Publishing Co., Inc.
11470 Sunset Hills Road
Reston, VA 22090
Softcover, 360 pp., $14.95

Here's a book every beginning VIC-20 programmer will want to get his hands on! In fact, it's such an excellent introduction to this popular computer that Commodore really ought to supply it free of charge with every VIC-20 sold. Since it addresses many questions that newcomers have (and does so in a clever, chatty style), much of the confusion which ensues when the new VIC-20 is unwrapped could be avoided. Let's first look at the contents and then finish off by noting why *VIC Basic* excels as a "first book" for VIC-20 users.

The authors are able to cover most of the Basic commands. Chapters one, two and three introduce the new user to the VIC-20 by demonstrating some of the features which make this computer stand out. Beginning aspects of color, sound and printing to the screen are illustrated along with the notions of cursor control and error messages.



Chapter four acquaints you with the concept of a stored program while illustrating how the screen editor functions. Commands such as List, Goto and For/Next are demonstrated in the course of this chapter, and the various forms of punctuation allowable in a Print statement are also explained.

After these four chapters, you will have enough information to start punching in programs of your own devising, and the authors test your skill by presenting an interesting word game in chapter five. This game, called Word's Worth, besides being fun, is also useful in that it introduces the notions of problem solving, palindromes and codes.

Chapters six and seven drive home the importance of numeric and string variables, as well as making clear some of the quirks of the VIC-20's number-handling ability. Rnd, If/Then, Read, Data and Input appear along the way and then are put to use in a music-maker program which is sure to delight even the most tone-deaf reader!

In Chapters eight and nine, the secrets of simple animation are unfolded by showing how to bring a variety of creatures to life on the screen. Bluebirds, rainbow crabs, ants and worms are all here, and the techniques involved in making them appear to move is treated in some detail.

You'll need a little relaxation at this point, so the Word's Worth game is revisited in chapter ten, with several new puzzles and teasers. As before, although games may not seem to be all that important, you will learn useful tidbits about problem solving and computing.

Chapters eleven, twelve and thirteen climax all that has come before and serve to reveal the slant of the whole book. It's clear that the authors enjoy graphics, sound and color, and the last three chapters delve into these areas more deeply. Harmony, special effects and crashes are explained, and the essential idea of polyphony is illustrated in some simple programs.

Next, a dice-throwing simulation is treated with some ideas on how to produce a realistic screen display. For any gamesters in the crowd, a complete program listing for a challenging memory game is presented; besides being fun, it serves to show how the VIC-20 can excel at various game-playing tasks. Finally, the last chapter shows how to best use the Poke command, while explaining the tricky business of screen codes at the same time.

A variety of appendices polish off the book. Tables of color codes, screen codes and musical note information will be of use to the amateur game-maker, while the section on using the Datassette will help the novice in using mass storage. Other tables show reserved words and error messages.

What are the outstanding features of this book? What topics are glossed over or not treated at all? What audience will derive the most benefit from it? Having overviewed the contents of the book, let's see if we can answer these three questions.

Perhaps the single most outstanding feature of *VIC Basic* is its excellent visual appeal. Many, many displays, pictures and cartoons grace the book. (By the way, the cartoons are quite funny and not just trivially related to the subject matter!) In general, between the clever word descriptions and the excellent illustrations, you would find it difficult to get lost in any concept.

Another nice feature is that each chapter is organized in such a way that several related Basic commands are taught simultaneously. At the end of each chapter there is a summary of the key concepts and a quiz with accompanying answers to test your knowledge. *VIC Basic* could well find its way into any school program as an excellent introduction to programming the VIC-20.

> *A breezy, relaxed format leads to an understanding of the Basic language.*

What subjects are missed? Well, quite a few, actually. No mention is made of files, mass storage, arithmetic or logical functions, high-resolution graphics, the function keys, machine language programming or peripherals (except for a brief explanation of using the Datassette for saving programs).

Obviously this book is slanted towards the novice. Seasoned veterans will find nothing new here, but the VIC-20 tyro will feel quite at ease in developing some fundamental skills at the keyboard. Although the cartoons and chatty style may lead you to believe this book is only suited for youngsters, it is equally probable that older folks will get a kick out of it too, since the book makes it quite clear that computers are not fearsome creatures after all!

VIC Basic is a superb book for any newcomer to the VIC-20. A breezy, relaxed format takes you painlessly down a path which leads to a fundamental understanding of the Basic language. And along that path many fun side roads pop up that should convince you that the VIC-20 is lots of fun for creating simulations, word games and multicolor graphics with plenty of sound and action.

Thomas Henry
Mankato, MN

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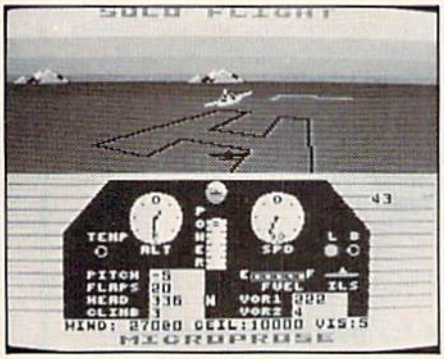

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Solo Flight is available on disk for $34.95. MicroProse Software, 10616 Beaver Dam Road, Hunt Valley, MD 21030.

Check Reader Service number 428.

Capture the Mothership

Softsync, Inc. (14 East 34th St., New York, NY 10016) has released Mothership, an arcade-style game for the Commodore 64.

You start in the Zarway corridor, screaming along in 3-D, avoiding drone fighters that swarm out of the Mothership. The next level transports you inside the Mothership, where you must attempt to capture the ship by penetrating its Communications Center. If you're successful, you can then pilot the ship for an attack on an enemy planet.

Mothership is available on disk for $29.95.

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Blue Max puts you in the open cockpit of a British World War I biplane. You soar through the skies, bombing enemy targets that dot the riverbank below.

After making it through your first bombing run, you must safely land your plane to refuel and reload, and then prepare to take off again. Your control panel monitors your fuel, the number of bombs you have left, airspeed, altitude and score.

Blue Max requires a joystick and is available on disk for the Commodore 64. It costs $34.95. Synapse Software, 5221 Central Ave., Richmond, CA 94804.

Check Reader Service number 424.

Tymac Talkies

Tymac, Inc. (129 Main St., Franklin, NJ 07416) has introduced two new games for the VIC-20 that feature words, music and sound effects without the need for a synthesizer.

Samurai is an action game for one or two players. Each player is an honorable Samurai from a respected family who must wield precision weapons with split-second timing in an effort to defend the family's honor.

In Codename: Deadzone, you are a lieutenant who must battle the mad leader of a hostile nation that has developed a deadly viral plague. You must prevent them from unleashing the plague on the world.

Both games are available on cartridge for $34.95.

Check Reader Service number 417.

POGO JOE
POGO JOE
screenplay

Pogo Joe

Screenplay (PO Box 3558, Chapel Hill, NC 27514) has released Pogo Joe for the Commodore 64.

In Pogo Joe, you are presented with 64 different screens of cylinders through which to guide Pogo. You control his fate as he jumps from cylinder to cylinder, changing the color on top of each, which allows him to move on to the next screen. The more screens you complete, the more dangerous your mission becomes as you try to bounce Pogo Joe to safety.

Pogo Joe is available on disk and cassette for $24.95.

Check Reader Service number 418.

Raging Battle on the High Seas

Sirius Software, Inc. (10364 Rockingham Drive, Sacramento, CA 95827) has released Wavy Navy for the Commodore 64.

The game puts you in the midst of a raging battle on the high seas. One to four players can work their way up from galley slave to president in ten increasingly complex rounds. Huge rolling waves force you to continuously change positions, exposing you to mines in the water as well as enemies in the air.

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Two Games from Handic Software

Handic Software, Inc. (5090 Central Highway, Suite 7, Pennsauken, NJ 08110) has released Space Action 64 and Bridge 64.

In Space Action 64, your mission is to protect Earth from an army of mutants bent on destroying all and raping the planet of its mineral content. It is available on cartridge for the Commodore 64. It costs $24.95.

Bridge 64 is a bridge game for all levels of players. Thousands of different bids are possible. The basic rules of the game are included in the instruction manual for beginners wishing to learn the fundamentals. Bridge 64 is available on cartridge for the Commodore 64. It costs $39.95.

Both games are also available for the VIC-20.

Check Reader Service number 422.

The Official
Moon Shuttle
DataSoft Inc.

Battle the Prince of Darkness

Datasoft, Inc. (9421 Winnetka Ave., Chatsworth, CA 91311) has released Moon Shuttle for the Commodore 64.

As you pilot your Moon Shuttle through outer space, each pass becomes more perilous than the preceding one. You must overcome life-threatening obstacles, such as meteors, bomb launchers and expandos.

Your next challenge is to out-maneuver spinning rockets on your way to an ultimate rendezvous with the Prince of Darkness. Just as you think you're home free, the Prince shows you his darkest side—his forces multiply!

Moon Shuttle is available on disk and cassette for $34.95.

Check Reader Service number 419.

Spare Change
Arcade Action and Antics by Dan and Mike Zeller
COMMODORE 64 DISK VERSION by Steven Ohmert
Brøderbund

Spare Change for C-64 Owners

In Spare Change, you are the owner of the Spare Change Arcade. Your business is booming, thanks to a new game that is breaking all records. But suddenly there's trouble! The two Zerks, who are the main characters of the new game, have broken loose and are trying to save enough tokens in their piggy bank to retire.

You try everything to stop them from pilfering your tokens, from playing their favorite songs on the juke box, to popping popcorn and ringing the pay phones. Each time you distract them, you are free to collect tokens. When you save enough tokens, you are treated to one of several slapstick cartoons starring the Zerks themselves.

Spare Change is available on disk for the Commodore 64. It costs $34.95. Broderbund Software, 17 Paul Drive, San Rafael, CA 94903.

Check Reader Service number 423.

Desert Warfare

Knights of the Desert is a recreation of the North African campaign of World War II in which British troops held off the sweep of Rommel's Panzer divisions.

In solitaire mode, the computer directs the British forces. In the two-player mode, you can command either the Germans (whose campaign is hindered by supply shortages), or the British (who must contend with the swiftness of the Panzer units and low morale).

Knights of the Desert is available on disk or cassette for the Commodore 64. It costs $39.95. Strategic Simulations, Inc., 883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043.

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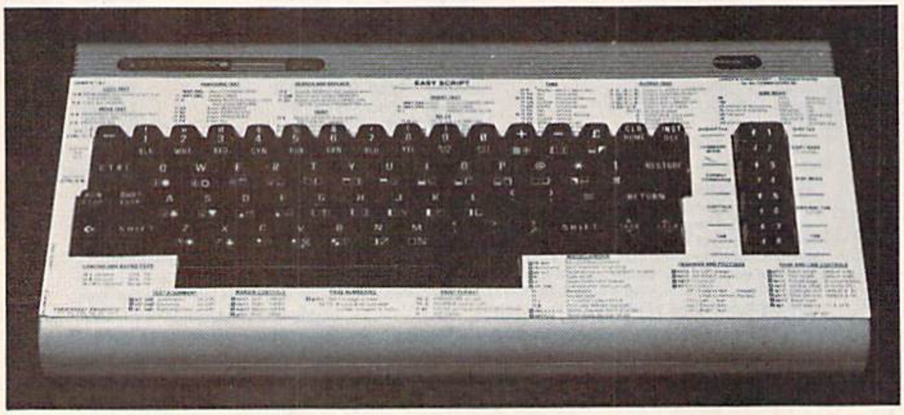
Hardware RUNdown

Compiled by Shawn Laflamme



Cheatsheets

Cheatsheet Products (PO Box 8299, Pittsburgh, PA 15218) has introduced Leroy's Cheatsheet keyboard overlays for the Commodore 64 and the VIC-20.

The overlays are plastic-coated templates that lie on your C-64 or VIC-20 keyboard. Each Cheatsheet is designed for a particular software program. Commands and functions are grouped together according to their function and use.

Cheatsheets are available for 11 C-64 programs and 11 VIC-20 programs. They cost $3.95 each.

Check Reader Service number 437.

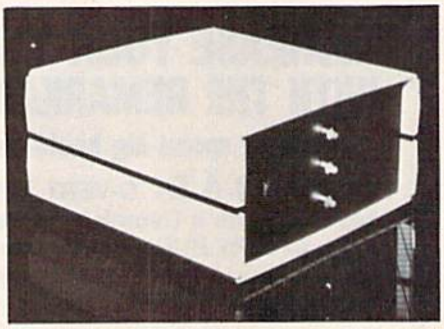
McPen

Madison Computer (1825 Monroe St., Madison, WI 53711) has introduced McPen, a hi-res light pen for the Commodore 64 and the VIC-20.

With McPen, you can answer questions, create drawings and play games by pointing the pen at the screen. It provides vertical and horizontal positioning on the screen. A sensitivity control allows you to fine-tune the pen's responsiveness to suit your needs.

McPen comes with a stand and software. It is available for $49.95.

Check Reader Service number 434.



Power for Your Micro

A new, uninterruptible power supply for your micro has been released by Transwestern Products Corp. (1711 Senter Road, San Jose, CA 95112).

The Ultraguard power supply is an ac-powered, battery backup power source. The unit prevents data loss and possible computer damage due to blackouts and resultant power surges. Ultraguard gives you up to 30 minutes of power, enabling you to save work in progress and shut your system down.

Ultraguard weighs 15 pounds and provides 200 watts of uninterruptible power. It contains a rechargeable, sealed battery, an automatic battery recharger, a solid state power inverter and complete overload and short protection. The unit is available for $649.

Check Reader Service number 429.

Micro Sketching

Tech-Sketch, Inc. (26 Just Road, Fairfield, NJ 07006) has introduced the Tech-Sketch Light Pens for the Commodore 64 and the VIC-20.

The light pens work directly on the CRT screen to access computer programs and manipulate data. By touching the screen with the pen, you can select from a menu or control the cursor.

Two models are available: the LP10-S, for controlling the cursor by screen contact, and the LP15-S, a hi-res pen for controlling the cursor up to six inches from the screen. A free Paint-N-Sketch I program is included with the pen. Twelve other programs are also available.

The Tech-Sketch Light Pens are priced from $39.95.

Check Reader Service number 432.

Super Disk Drives

MSD Systems, Inc. (10031 Monroe Drive, Suite 206, Dallas, TX 75229) has introduced the MSD single and dual Super Disk Drives.

These are "smart" disk drives that do not require the use of any memory in the computer. They contain their own microprocessors and memories, enabling the computer to send the drives a command and then continue other operations. The disk drive processes the command and performs the specified function.

The SD-1 single disk drive has 4K of buffer memory and is available for $399. The SD-2 dual disk drive has 6K of buffer memory and can be configured as two single drives or one dual drive. It costs $695.

Check Reader Service number 433.

Printer Interface

The Parallel Printer Interface, from Data 20 Corp. (23011 Moulton Parkway, Suite B10, Laguna Hills, CA 92653), allows standard parallel printers to be interfaced with Commodore computers.

The interface translates the Commodore character set into ASCII. It does not require power from the printer, computer or any external source. Under normal operation, the interface is used with an ASCII (non-Commodore) printer to emulate a Commodore 1525 printer.

The Parallel Printer Interface is available for $49.95.

Check Reader Service number 436.

Tape Interface & Duplicator

The Universal Tape Interface & Duplicator allows C-64 and VIC-20 owners to connect almost any audio tape recorder to their computers.

You can use it to save and load data or programs with your own tape recorder instead of Commodore's Datassette. It can automatically turn your tape recorder on and off. Three LED indicators show complete status of cassette operation.

The Universal Tape Interface & Duplicator is available for $49.95 from Tymac, Inc., 129 Main St., Franklin, NJ 07416.

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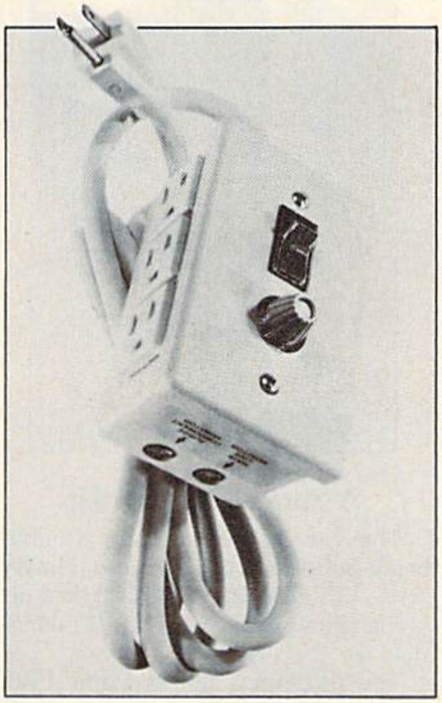

Surge Controller

Protection for your computer and peripherals is available with the Power Surge Controller from Cable Electric Products, Inc. (PO Box 6767, Providence, RI 02940).

An illuminated rocker switch controls six grounded outlets housed in a plastic box. Red and green monitor lights indicate incoming power and the operative condition of the surge controller.

The direct plug-in model is available for $59.95. Another model, with a six-foot cord, is available for $69.95.

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Software RUNdown

Compiled by Shawn Laflamme

Micro Melody

Waveform Corp. (1912 Bonita Way, Berkeley, CA 94704) has released MusiCalc 1, a music synthesizer for the Commodore 64.

The program lets you play along with pre-programmed melodies, or create and store your own melodies for later playback. You can compose and perform in styles such as classical, new wave, Japanese, Latin and African.

MusiCalc 1 is available on disk for $74.95. MusiCalc 2 and 3, a scorewriter and keyboard maker, respectively, are available for $34.95 each.

Check Reader Service number 408.

Create Video Displays

U-D-Zign is a text and graphics display system for the Commodore 64. It lets you create video displays for presentations, proposals, ad layouts, etc.

You can choose from among four letter types and 16 colors. You can display many lines of text per video screen and up to 12 screens per display. Bar charts and diagrams can also be created.

U-D-Zign is available on cassette for $39.95 from Feerst Software, Inc., PO Box 1333, Cambridge, MA 02238.

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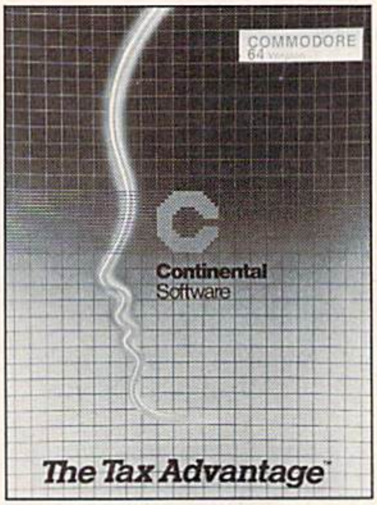

A Sure Sign of Spring

The Tax Advantage, from Continental Software (11223 South Hindry Ave., Los Angeles, CA 90045), is a tax preparation package for the Commodore 64.

The program supports Form 1040, schedules A, B, C, D, E, G, W and SE and Form 4562. All program functions are menu controlled.

The program's features include: the ability to itemize any line on the form at any time; a description key that can describe a particular line from the 1040 or the schedules; and automatic tax calculation at any time.

The Tax Advantage has interface capability with Continental's household finance package, The Home Accountant. The Tax Advantage is available on disk for $69.95.

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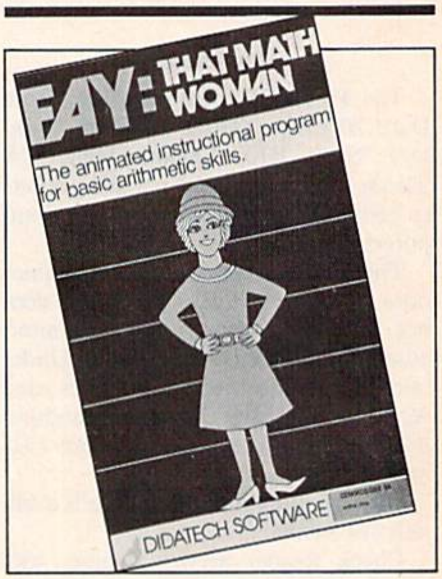
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Fay: That Math Woman is an animated instructional program for basic arithmetic skills. The program is designed for children in grades one to four.

There are two game levels; both levels use addition and subtraction, and the second level uses multiplication and division. The program uses the number line as the basis for instruction. When your child answers a math problem, Fay moves briskly along the line according to the answer given.

Time is vital in both games, and your child must save Fay from random numbers appearing on the line by giving correct answers.

Fay: That Math Woman is available on disk for the Commodore 64. It costs $29.95. Didatech Software, 2301-1150 Jervis St., Vancouver, BC, Canada V6E 2C8.

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Kraft Switch-Hit Joystick	19.95	15.85
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Superbase 64
The complete information control system for the Commodore 64

C-64 Database

Superbase 64 is a database management and information retrieval system with a user-programmable interface.

Each record is definable beyond 1100 characters, with up to 127 items per record. Files of up to 16 million characters can be maintained.

You can design your own record layouts and either work entirely from the menu options or write your own special program to meet your needs. If you have no programming experience, you can use the Superbase 64 command set.

Superbase 64 can be linked to word processing to produce lists for mailshots, tables, labels production and more. It is available on disk for the Commodore 64. It costs $99. Precision Software (USA), Inc., Suite 11D, 1675 York Ave., New York, NY 10128.

Check Reader Service number 404.

Sizzling Software

Hot Accounts is a financial records management system designed for home accounting, business applications and professional settings.

The program records daily income and expense transactions, and it has full data retrieval capabilities. The system can search and sort information from the database by a single demand factor. It can produce many types of printed reports, income statements and graphs.

Hot Accounts has full keyboard control to prevent input errors. It is available on disk for the Commodore 64. It costs $64.95. Computer Ed. Software, 1002 Brookes Ave. West, San Diego, CA 92103.

Check Reader Service number 407.

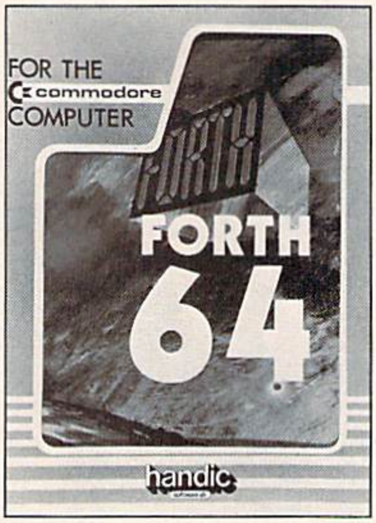
Keep in Touch

Phone-Dial 64 is a disk-based program for the Commodore 64 that enables any touch-tone telephone to communicate with any device (computer or phone) that can be communicated with by touch tone. It works acoustically without the need of a modem.

Phone-Dial 64 can be made to continuously dial any selected series of sequential or random telephone numbers. You can compile a master list of numbers and names and call through the list sequentially. You can also dial numbers selectively by choosing the desired number from the screen format on your monitor.

The program is formatted for the 1541, 4040, 2031 or the 8050 Commodore disk drive. It costs $24.50. Input Systems, Inc., 25101 S.W. 194 Ave., Homestead, FL 33031.

Check Reader Service number 405.



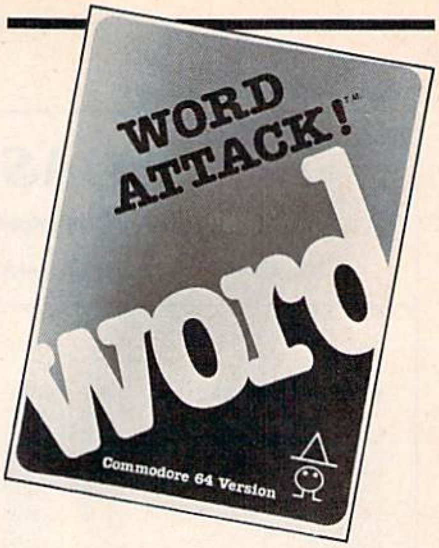
Venture Forth!

Forth 64, from Handic Software, Inc. (5090 Central Highway, Suite 7, Pennsauken, NJ 08110), is an operating system with a programming language, suitable for business applications and process control environments.

Forth 64 provides an interactive, structured program environment. It functions in any numeric base. A text editor and a macro assembler are included in the program. It supports disk and printer I/O.

Forth 64 is available on cartridge for the Commodore 64. It costs $39.95. A version is also available for the VIC-20 (3K of RAM).

Check Reader Service number 415.



Word Attack!

Word Attack! is a vocabulary building program for grades 4 through 12. It contains 675 words, grouped in ascending levels of difficulty for use in four learning activities.

The four activities are a word display, a multiple-choice quiz, a sentence completion exercise and an arcade game that reinforces the student's new vocabulary skills.

The program includes an editor that allows parents and teachers to enter additional words for use with all four learning activities.

Word Attack! is available on disk for the Commodore 64. It costs $49.95. Davidson & Associates, 6069 Groveoak Pl. #14, Rancho Palos Verdes, CA 90274.

Check Reader Service number 409.

Get Ready for College!

Quality Input, Inc. (Suite 8, 309 West Beaufort, Normal, IL 61761), has released the ACT/SAT Review package for the Commodore 64.

The package consists of 98 programs and over 50,000 questions designed to help prepare students for the College Entrance Examinations. It includes all subjects covered by the tests, such as English, math, reading comprehension, natural and social sciences and the Test of Standard Written English.

The ACT/SAT Review package is available on disk for $179.95. The ACT and SAT segments of the package may be purchased separately for $99.95 each.

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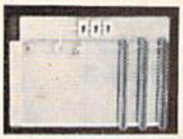

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Now you can easily store and recall your favorite recipes on your Commodore computer. THE RECIPE BOX is a complete menu-driven disk system that comes with these additional features:

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SEARCH BY CATEGORY — Code your recipes as to breakfast, lunch, dinner, snacks, etc.

SEARCH BY CATEGORY/INGREDIENT — Any combination of the above.

AUTOMATIC MEASUREMENT — THE RECIPE BOX will automatically scale up or down the amount of ingredients you need according to how many servings you want.

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THE RECIPE BOX requires one disk drive and will run on a 5K VIC-20, Commodore 64. Please specify. Send check or money order for $19.95 to:

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SOFTSYNC, INC.

Personalized Accounting

Softsync, Inc. (14 East 34th St., New York, NY 10016), has recently released the Personal Accountant for the Commodore 64.

The program provides professional financial reports that list assets and liabilities or a Trial Balance for a small business or home. It will also prepare an income and expense report. Personal Accountant has a name and address file that can be accessed from the Budget mode.

Personal Accountant is available on disk for $34.95.

Check Reader Service number 414.

Learn Basic Programming

Timeworks, Inc. (405 Lake Cook Road, Deerfield, IL 60015), has introduced Programming Kits II and III for the Commodore 64. These new programs, together with Programming Kit I, offer a how-to learning approach to Basic programming.

Programming Kit II is a game design and sprite builder. It is designed to allow intermediate level users to delve deeper into the powers of the C-64 by taking part in the design of Slot Machine, a game of skill and chance.

In Programming Kit III, intermediate level users take part in the design of a fundamental database that can be used for anything from a mailing list to a date reminder.

Each of the three kits is available on disk for $24.95.

Check Reader Service number 412.

For Machine Code Programmers...

Codefax 6502, from Gloucester Computer, Inc. (1 Blackburn Center, Gloucester, MA 01930), provides an integrated, interactive environment for trial and error experimentation with machine code and assembly language programming.

Codefax opens an interactive window anywhere in memory. The display shows the absolute address in memory, the user-selectable address for which assembly and debugging are desired, the machine code present in each location, the character or color present, any labels assigned to the program code, a disassembly into mnemonics and your references to labels that a "linker" uses to figure addressing in the code.

The visual link pass matches labels and references, stops on any errors and tells you what to fix. I/O support includes disk, printer and RS-232 utilities integrated with the Codefax window.

Codefax 6502 (on a 2764 EPROM, with EPROM programmer/adapter) is available for the Commodore 64. It costs $199. Codefax (disk) with device I/O package costs $99.

Check Reader Service number 402.

More Computer Stuff...

Data*Max, from Computerstuff (308½ Green St., Yankton, SD 57078), is a multi-functional database system for the Commodore 64. It can handle a variety of home filing chores.

The program can maintain an unlimited number of 10,000-character files containing up to 200 eight-field records each. A sub-file option lets you split a full file into two or more smaller ones, enabling expansion beyond the 200-record limit.

You can search and sort records by any field or combination of fields. The program can also create special sorted files which can be read by word processors for generation of form letters, labels and invoices.

Data*Max is available on disk for $29.95.

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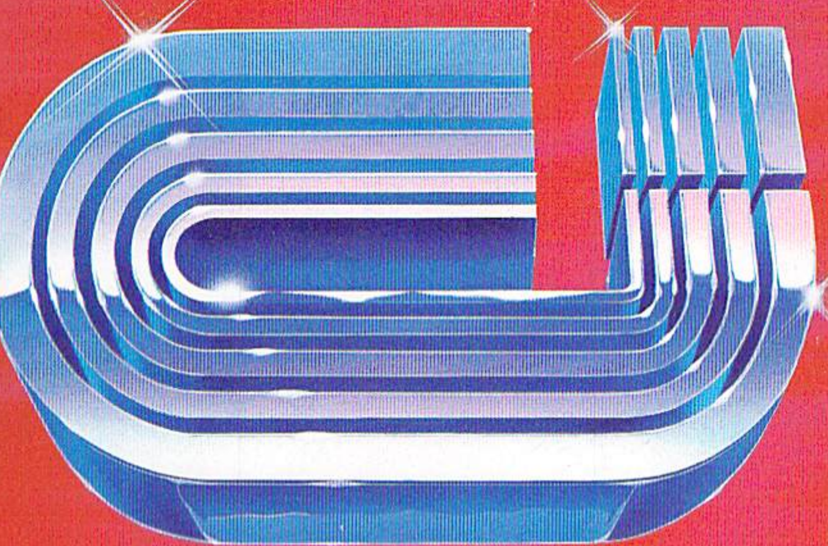

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The *WRITE NOW!* Word Processor provides you with the easiest to use & fastest to learn format available for your C-64. It gives you the features you expect in a professional word processor & some unique features not available in any other C-64 word processor.

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